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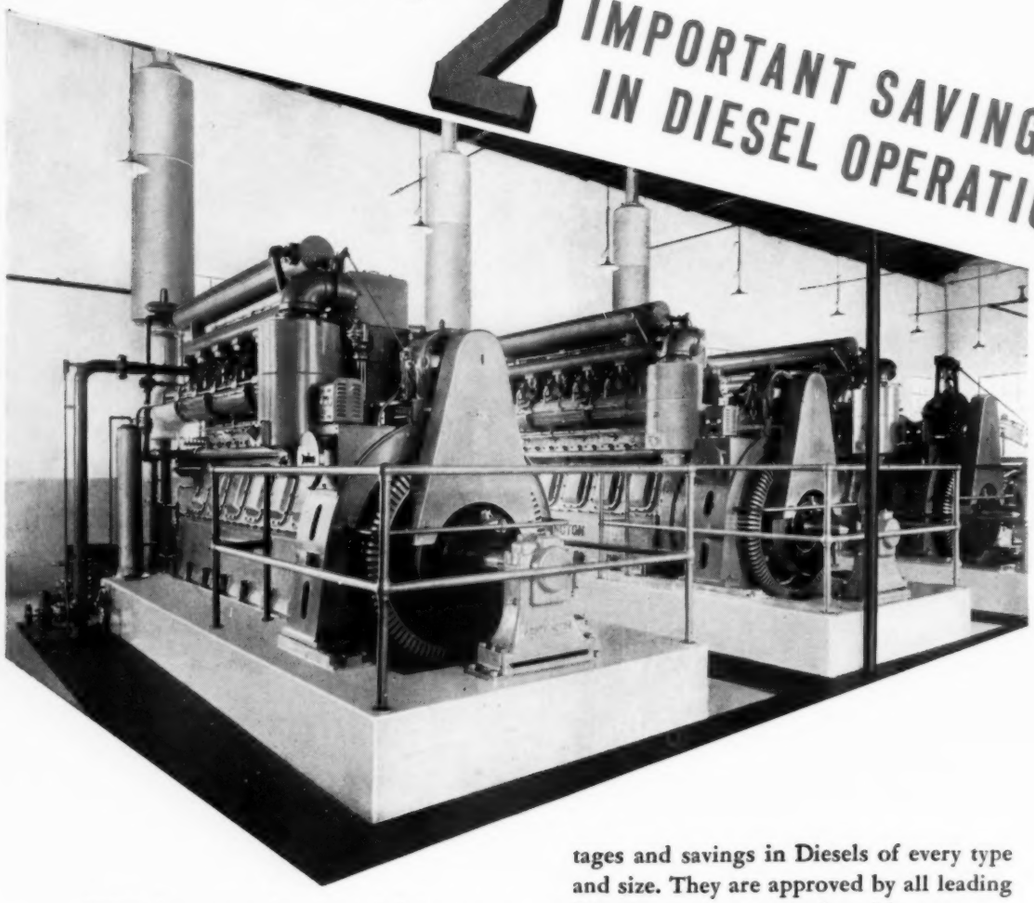

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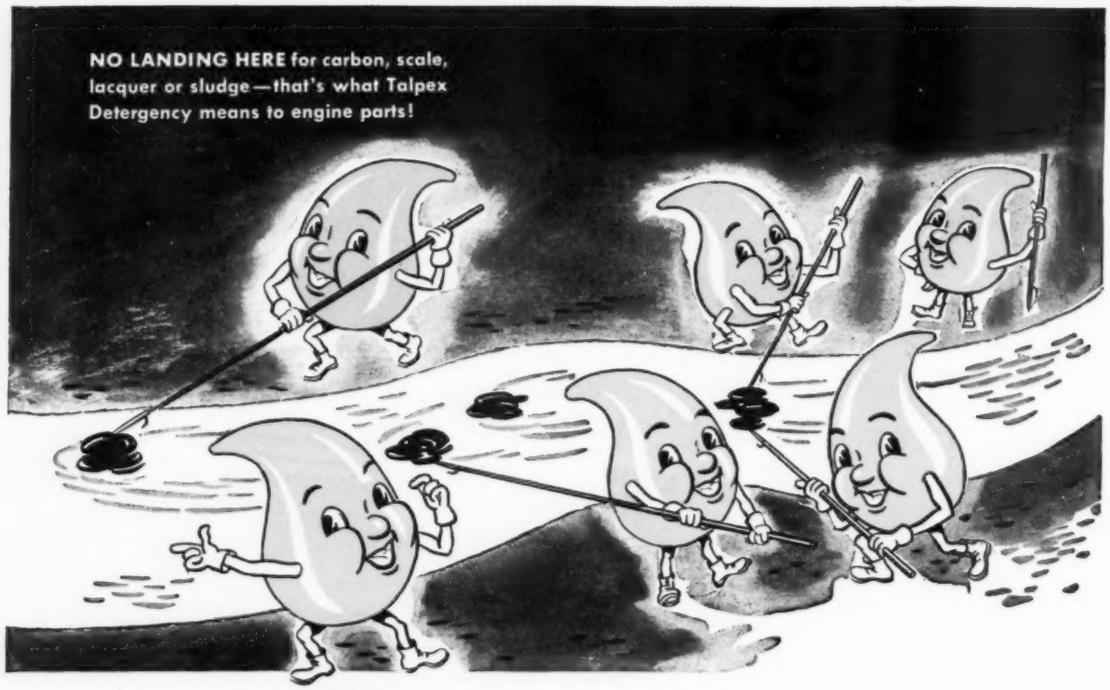

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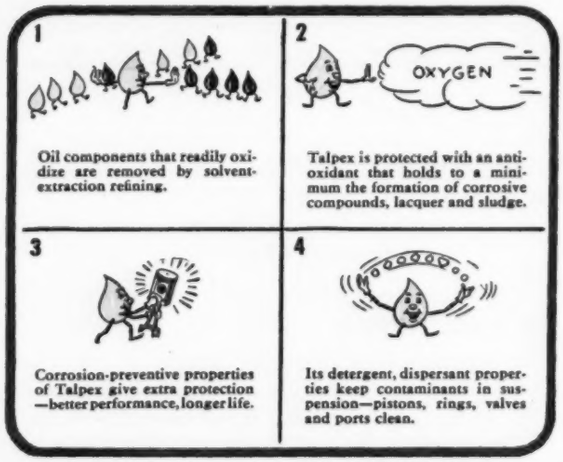
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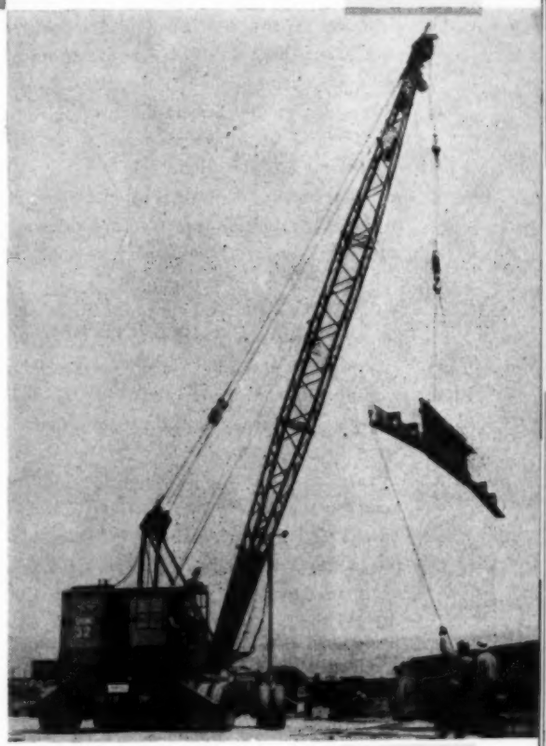
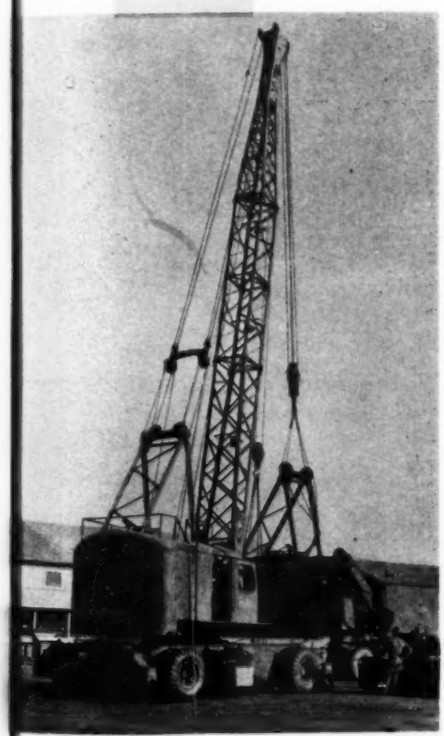
SHELL DIESEL LUBRICANTS

Part of a fleet of 30 Diesel-engined Maxi trucks owned by a west coast contractor. Each truck has a 40 ton capacity.

"MAXI" ENGINEERED HEAVY DUTY TRUCKS



A Bucyrus-Erie 30-ton crane on a Maxi carriage at work at a Richmond, California shipyard.



Maxi-mounted 40-ton Northwest crane assisting in a crane conversion operation.

A WEST coast concern, Six Wheels, Inc., manufacturers and engineers, specializes in the conversion of power cranes and the assembly of heavy duty trucks. Their heavy duty trucks have been extensively used in large scale earth-moving operations from Panama to Kodiak. The Diesel models with Cummins engines are of 40-ton capacity and utilize a special dual chain drive.

The crane carriage produced by the company is suitable for cranes up to 50 tons capacity and is supplied motive power by the crane engine through a vertical travel shaft arrangement. All operations of driving the carriage, steering, braking and shifting of gears are controlled by the operator within the cab.

Truck fleet at work loading fill material for San Francisco Airport. The shovels seen are equipped with Murphy Diesels.

ANOTHER FIRST FOR DIESEL ELECTRIC DRIVE

By REX W. WADMAN

CLEVELAND, Ohio, September 17th, 1946. Back over the years it has been my privilege and pleasure to be on the spot to witness and describe each and every "first" in the development and expansion of this Diesel Industry of ours. Away back in 1918 I went aboard the yacht *Elfay* and wrote up the description of what was then the first installation of Diesel-electric drive in this country and, if my memory doesn't fail me, in the whole world. The two men responsible for that outstanding "first" in the application of Diesels to marine propulsion were George W. Codrington (then General Manager of the Winton Engine Company) and Wilfred Sykes (then associated with Westinghouse.) These two men persuaded Russell Alger, owner of the *Elfay*, to pioneer a new and radically different type of marine Diesel propulsion. It worked, splendidly so, and the *Elfay* went down into history as a highly successful experiment which opened up a whole new vista for Diesel engine sales. Today, here on Lake Erie these two men are together again, pioneering a new and equally epochal development in broadening the market for Diesel engines and accessories.

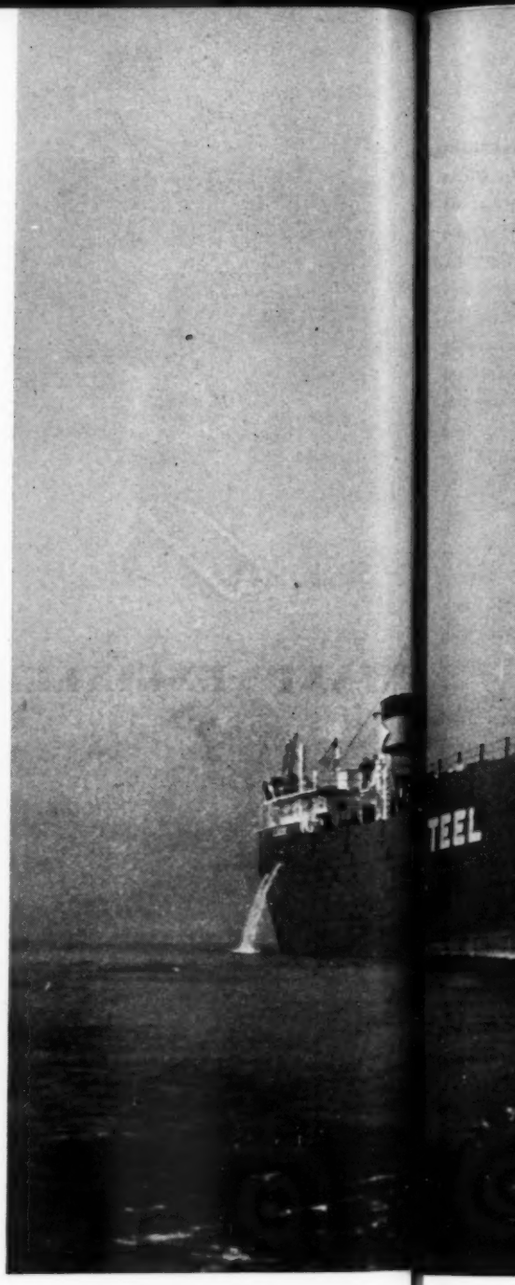
Today Wilfred Sykes is President of the Inland Steel Company, owner of the Great Lakes ore carrier *E. J. Block* and George Codrington is Vice-President of the General Motors Corporation, but both of them still have that pioneering urge which twenty-eight years ago drove them to taking all the chances inherent in sponsoring such a new, untried development as Diesel-electric drive.

In the past few months these two men have collaborated in developing a new and equally radical application of Diesel-electric drive—this time to supplying the power plant for a Great Lakes ore carrier, a type of ship which, over the years, has been married to, tied to, spliced to and welded to steam power. It couldn't be done but these two men did it—they applied Diesel-electric drive for the first time in history to a typical Great Lakes ore carrier. And what is the result? As we sit here today on Lake Erie spinning out the careful trial trip routine of the Coast Guard, of the owners and the shipyard which handled this conversion so well —out of these checks and double checks come the results which prove the equation — Enough extra speed to provide two or more round trips during the operating season. A ten per cent increase in over-all tonnage. A substantial saving in fuel cost and space devoted to fuel. A tremendous increase in speed of docking and handling and the great asset of being able to shut down the main engines immediately the lines are taut to shore and rely entirely on the auxiliary power plant for loading, unloading and just standby requirements.

The conversion of the ship from the traditional type ore carrier to one with such up-to-the-minute improvements as Diesel-electric drive, radar, and an all-electric galley has taken place during the past several months at the Lorain yards of the American Shipbuilding Corporation.

Following its successful trial run, the big ship sailed to the head of the Lakes to pick up a bulk cargo of raw materials for the Inland Steel Company at Indiana Harbor, Ind. The reconversion and modernization of the *E. J. Block*, which has a keel length of 532 feet, a beam of 56 feet, a depth of 31 feet, and an 11,000-ton capacity, has been complete from stem to stern. It ranges from removal of the old steam engines, boilers and coal bunkers to lifting the forecastle four feet and installing a streamlined, shortened aft smokestack for the Diesel engine's exhaust.

All the modernization was designed for greater speed, both in travel and in unloading and loading, greater safety, and more comfort for the crew. New ballast pumps of exceptional capacity, for instance, will be able to empty the ballast tanks much quicker than ever before and thus allow the ship to load more quickly and get under way for Indiana Harbor with the 11,000 tons of iron ore, limestone, or other raw materials it will haul on each trip.



"E. J. Block" pulling out of Lorain harbor on

The permanent installation of a proven type of radar on the *E. J. Block* gives the ship immeasurably added safety during bad weather and makes it the first ship so permanently equipped on the Great Lakes. Several other ships are equipped with experimental radar sets, but none, according to officials of the Inland Steel Company, have actually purchased and permanently installed such equipment.

The new power plant consists of two Cleveland Diesel Model 12-278A engines rated at 1200 brake horsepower each at 750 revolutions per minute, each engine driving an Allis-Chalmers electric generator. The generators, in turn,

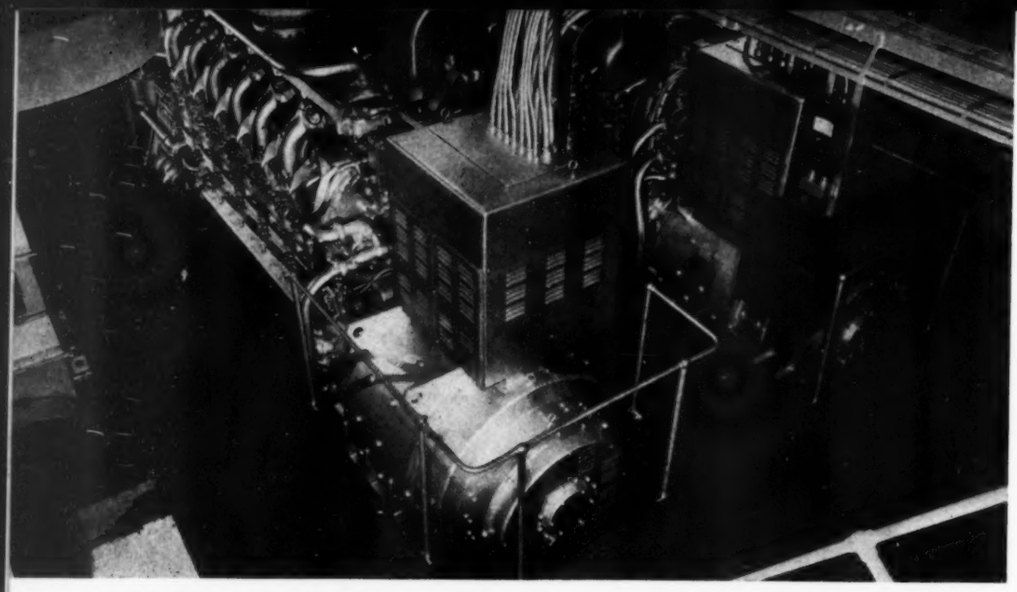
harbor on her trial trip. The first Great Lakes ore carrier ever to be equipped with Diesel-electric drive.

supply power to two motors that drive a single Farrel reduction gear, which develops 2,000 horsepower at the propeller shaft. Each set of Diesel engine and generator is capable of propelling the ship alone at reduced speed, even when it is fully loaded. In addition to the two main propulsion Diesel engines, the converted *E. J. Block* has three model 268A Cleveland Diesel engines and generators which furnish a total of 300 kilowatts for the ship's service needs –lighting, cooking, operating deck machinery, and other uses.

The crew's quarters aft were enlarged by eliminating the top section of the old coal bunker that extended above the spar deck to the top of the after deckhouse. The bunker up to the spar deck was converted into a fuel oil storage tank. To the casual observer, the modernized ship will have a more rakish appearance because of the elimination of the old style smokestack in favor of a much shorter and streamlined funnel and because of the raising of the bow four feet and the installation of a forecastle of new and modern design. The most revolutionary changes, however, are those brought about by the installation of the new Diesel-electric propulsion unit and the new hydro-electric steering gear. Hereafter, the captain of the *E. J. Block* will have direct control over the ship at all times instead of having to operate it by remote control through bell signals to the engineer.

The new hydro-electric steering gear consists of two sets of electric motors that pump oil into controlling rams to turn the rudder. The steering gear is controllable from several points throughout the ship. Tests have shown that the rudder can be turned from "hard over to hard over" in 21 seconds.

The deck of the ship has been remodeled so that the former 32 nine-by-thirty-four-foot hatches on twelve-foot centers have been re-



General view of the main engine room taken from the generator end. Allis-Chalmers generators, Bristol pyrometers.

Stern view of the "E. J. Block" which will become increasingly unpopular with the old fashioned steam driven Great Lakes ore carriers.

duced to 16 eleven-by-thirty-four-foot hatches on twenty-four-foot centers. The hatch covers can be removed or replaced speedily by a crane that travels on a rail along either side of the deck and stacks the covers between hatches. When the ship is underway the crane is firmly anchored forward. Necessary boilers to furnish hot water for the crew and steam for thawing hatches in frigid weather are located forward and aft. They burn Diesel fuel oil. The forward one expels exhaust gases through the forward spar, which is set slightly aft of the forecastle.

The *E. J. Block* was built in 1908, and is named after one of three sons of Joseph Block, a founder of Inland Steel Company. E. J. Block joined the company in 1901 and served with it until his death in 1939. He was vice-president in charge of purchases from 1919 to 1939. The ship is one of five in the Inland Steel Company fleet. The others are the bulk carriers *P. D. Block, L. E. Block* and *Joseph Block,* and the steel carrier *The Inland.* The carriers haul raw materials to the Inland Steel Company mill at Indiana Harbor, while *The Inland* carries finished steel products to ports everywhere on the Great Lakes.

As is always the case, much of the success of an installation like this is due to the careful selection of the auxiliary equipment. William Sellers & Co. of Philadelphia developed the very successful hydro-electric steering machine which makes it possible for the man on the bridge, nearly five hundred feet from the rudder, to handle the ship to a point where you could place an egg between the edge of the dock and the ship, hold it there without cracking its shell. King Engineering Company of Ann Arbor, Mich., supplied the very complete fuel oil tank gauges, both in the engine room and up on deck. Briggs Filtration of Washington, D. C., supplied the lube-oil clarifiers and DeLaval of New York supplied the two fuel oil centrifuges. Allis-Chalmers supplied the electrical end of the installation and Farrel-Birmingham the big reduction gear aft. Westinghouse Airbrake's air compressors handle the compressed air requirements. Exide batteries cover the emergency electric load. U. S. Gauges are found on all engine boards and Bristol pyrometers supply a close check on the main engine cylinder temperatures. Most of the pumps aboard are Worthington.

Possibly the most interesting gadgets aboard are the six Almon Johnson automatic mooring winches. These darned things are human, they hold onto the forward, aft and breast lines,

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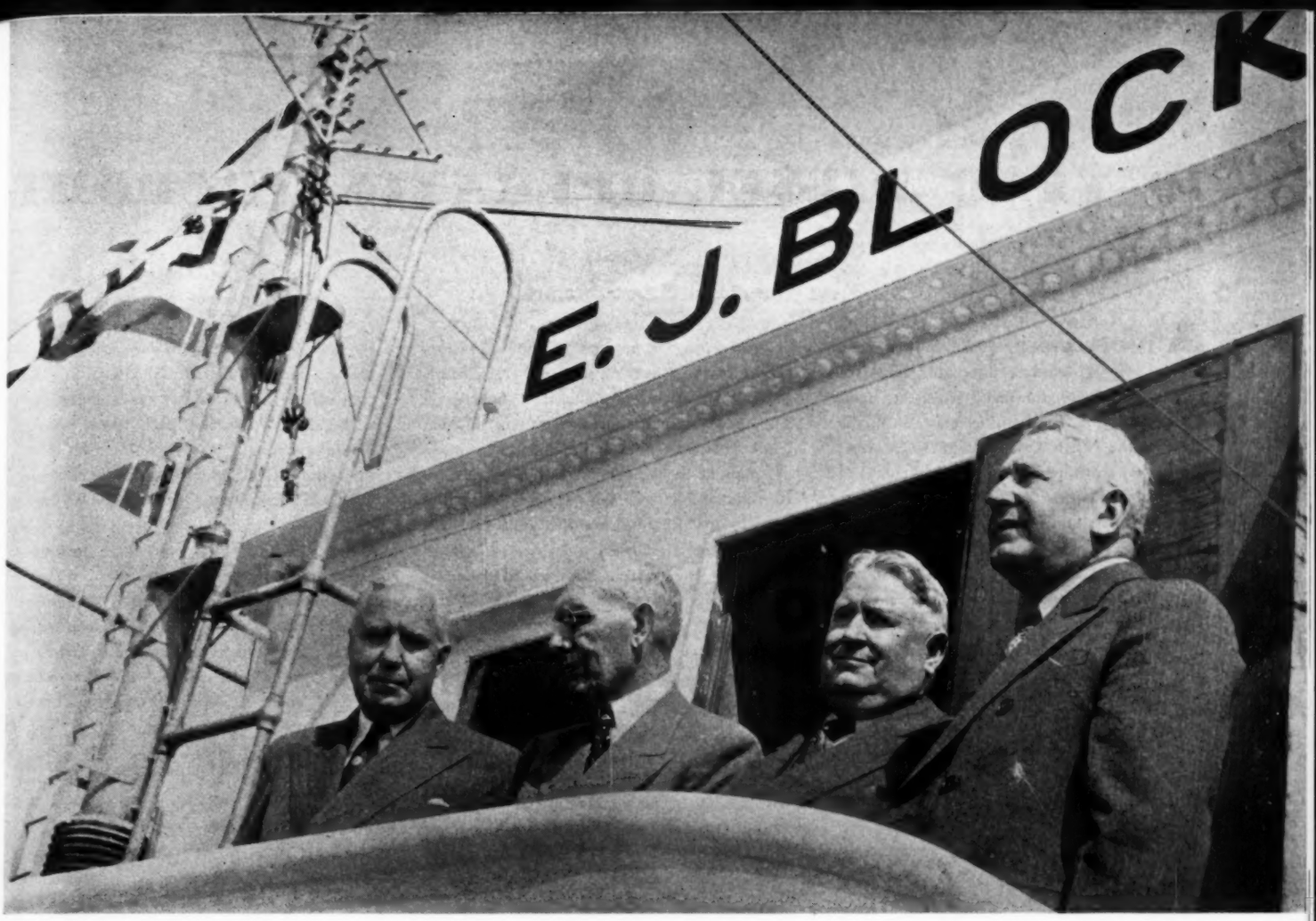


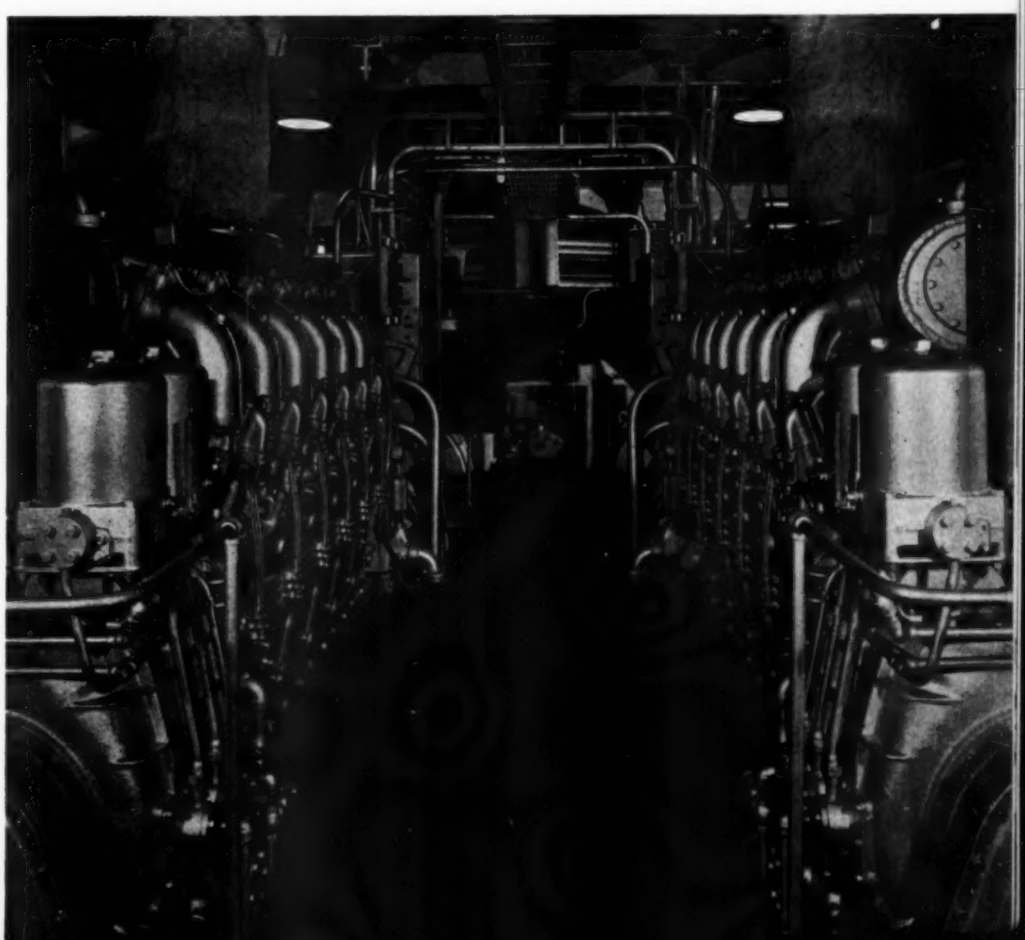
William Henry Gerhauser, Pres. American Shipbuilding Co.; Dr. Charles F. Kettering, Vice-President in charge of Research, General Motors Corporation. George W. Codrington, Vice-President, General Motors Corporation and Divisional head of the Cleveland Diesel Division; Wilfred Sykes, President, Inland Steel Company.

giving and taking automatically based on the tension on the lines. You sure can berth a ship in a hurry with Almon's winches. No human element involved, just a simple electrical formula adapted to an age-old problem—instantly easing up when the tension on any line goes beyond a certain point, instantly taking up the slack when a line eases up as the ship warps into dock. The Towing Industry and the Shipping Industry owe Almon Johnson a lot—just another of those guys who tackled a job which couldn't be done and did it—and then some.

All in all the *E. J. Block* will go down in history as contributing another "first" to the long line of Diesel achievements. It is only a matter of time before ALL new Great Lakes ore carriers are Diesel equipped. The economics of the situation can not be evaded or avoided.

Naturally the big ship operators on the Great Lakes will watch this *E. J. Block* and her performance but the answer is a foregone conclusion. There are many Diesel installations on the Great Lakes in other than ore carriers, all giving an excellent account of themselves.

Looking down the alley between the two main General Motors Diesels each rated at 1200 hp.



19-YEAR DIESEL OPERATING REPORT

By T. J. MALONE

A TWO-CYLINDER, 120 horsepower Diesel engine with 72-kilowatt alternator, both of Fairbanks, Morse & Co. make, which has operated steadily for the last nineteen years in the plant of the North East Feed Mill Company, Minneapolis, Minnesota, is producing energy at a cost of from three-fourths of a cent to one cent a kilowatt hour.

The plant has fifteen motors, of a combined 233.5 horsepower, including two 50 hp. motors. Because the mill outgrew the generation capacity of the Diesel unit, one of the fifties has used purchased energy for ten years. This permits comparison of kilowatt-hour costs. The cost of the purchased energy is said to run about 2½ cents a kilowatt hour. The other 50 hp. motor and all smaller motors are Diesel operated. Each fifty runs a Jacobson hammermill.

Replacing purchased energy, the Diesel unit took over in October, 1927. It has moved from 500,000 to 1,500,000 bushels of grain yearly ever since—oats, corn, wheat and barley.

John S. Schroeder, vice president and superintendent of the company, one of the four brothers comprising it, testifies to the satisfactory service of the Diesel through the years. It requires little attention, about three hours in a 24-hour day. For the last five years or so it has run without let-up day and night, from Monday morning to Saturday noon each week, except for time off for inspection. The day load varies from 10 to 40 kilowatts and the night load from 40 to 70, the latter nearly the rated capacity of the unit. The plant has carried overloads at times without any trouble.

Twice a year the engine is taken down and given a thorough going over. Minor faults are corrected as found. About two years ago all main bearings were replaced, the first time that had been done. In 1936, the engine was reconditioned, with installing of rebored cylinders, new oversized pistons, new pin bearings, and so on, new heads and a new injection system.

This, Mr. Schroeder, says, made a virtually new engine. It does its work today with no indication that it will not continue to do it for a long time to come.

Auxiliary to the engine and alternator, with 7½ kw. V-belt driven exciter, the unit comprises a General Electric switchboard, a Fairbanks-Morse motor-driven air compressor, a 2,500-gallon, Fairbanks-Morse water pump, a Maxim silencer, a Fairbanks-Morse built cooling tower, a Niagara fuel oil meter, a Honan-Crane oil purifier and a Permutit water softener.

Other Fairbanks-Morse equipment includes a 42-ton hopper—whopper too—scale, installed in 1902 and in continuous use since. The hopper is of wood. This scale weighs all incoming grain. Despite its long service, it stands up under rigorous state tests and meets all requirements. There is also an F-M 14-ton motor truck platform scale. Two small F-M bagging scales have over-under indicators.

A compact scratch-feed mixing unit is a special installation of the owner's design. A Strong-Scott two-ton mixer is installed in the basement. The scratch-feed mixture is elevated in buckets to the ceiling of the working floor (main) and moved through the conveyor to an automatic bagging scale. The drive motor of this system is installed in the head house over the roof. The elevator leg is installed in this head house.

Started in 1880, the North East Feed Mill has grown to the rambling group of buildings shown here.

The drive consists of a Morse silent chain not running in oil. The power for the elevator leg is from the conveyor shaft.

The mill product is sold in bags to the consumer. Credit is given for return of the empty bags and the plant puts them through a vacuum cleaning machine before re-use.

The mill mixes its own feeds—poultry, turkey, pig and cattle feeds, some horse feed, using such ingredients additional to the basic oats, corn, wheat and barley as alfalfa meal, soybean meal, corn gluten, linseed oil meal, bran middlings, meat scraps, calcium carbonate, salt, bone meal, dried buttermilk and fortified feeding oil. Enrichment for vitamin content is a major consideration in feeding livestock just as in the diet of human beings.

As wholesaler and jobber, the company serves about 500 country dealers in a wide area, supplying mainly ingredients for use in mixing their own balanced rations for poultry, turkeys, pigs and cows. The retail business is with consumers in a radius of, say, twenty miles from the mill site, 1428 Marshall Street Northeast.

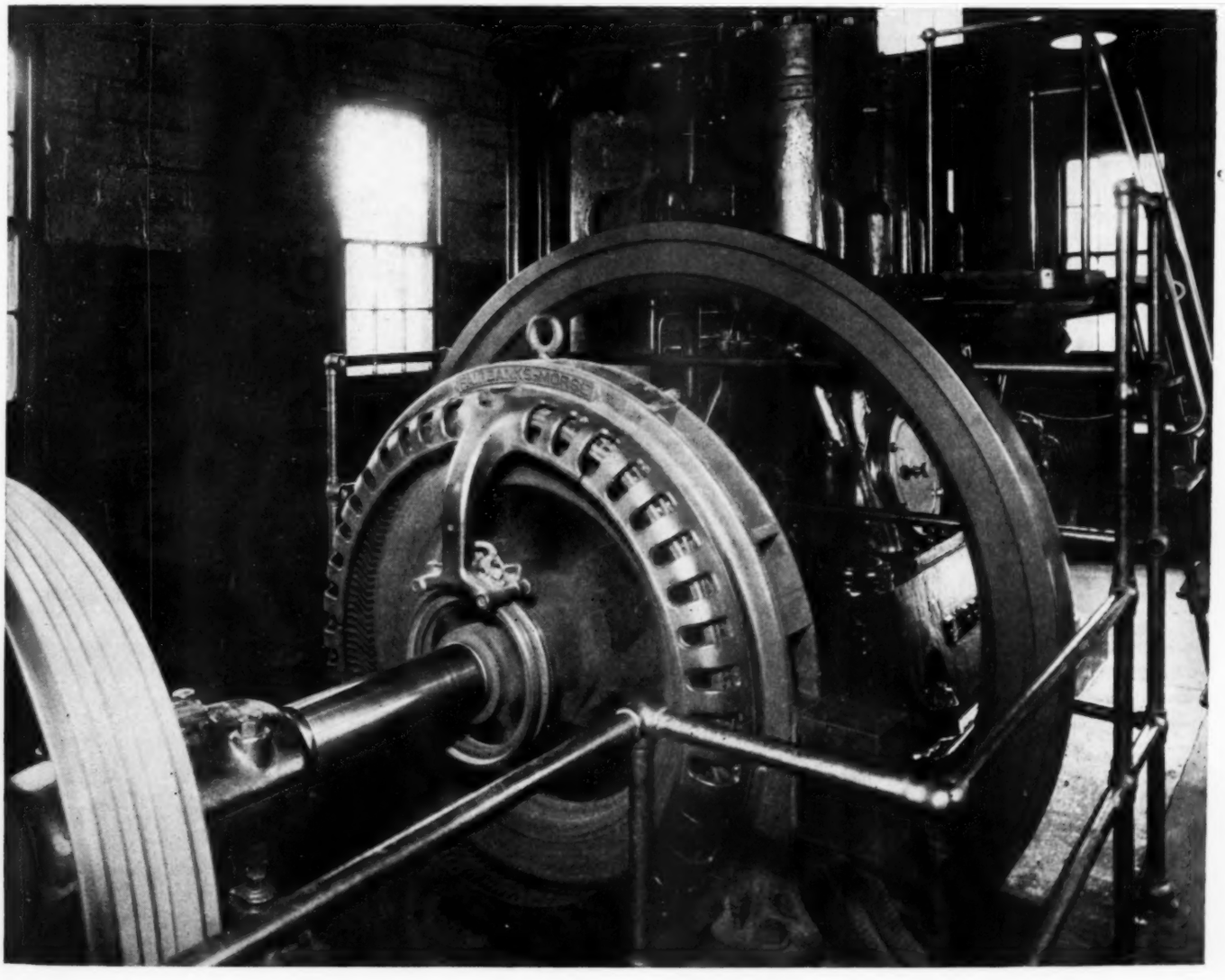
There has been a feed mill on the site since before 1880. With the first change of owners, John A. Schroeder, father of the quartet of brothers, a cooper by trade, bought an interest and the mill went under the firm name of Riedel & Schroeder. The letterhead reads today: "Established 1884. The Ingredient House." About 1894 the firm became the North East Feed Mill Company.

As Schroeder pere planned to retire from the business, the boys began to take over, each buying stock as it became available. They had sort of grown up in the mill, had worked there off and on, though all having had some outside experience too.

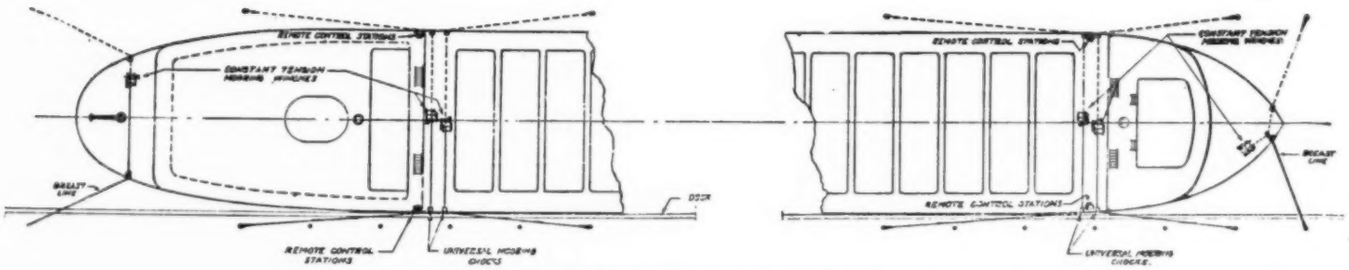
Joseph F. Schroeder, the oldest, is president, Arthur J. is secretary-treasurer, Donald is assistant secretary. John S. has been accounted for. The brothers would like to have David Carlson, the sales manager, named along with them, as having a drive, endurance, steadiness, wearing quality and ability to deliver very much like that Diesel engine.

The savings that this 19-year-old Diesel has made possible over its period of operations with its energy producing cost of less than one cent per kilowatt hour is impressive.

The 19-year-old Fairbanks-Morse 120 hp., 2-cylinder Diesel which powers the North East Feed Mill.



AUTOMATIC WINCH OPERATION ON THE "E. J. BLOCK"



Schematic drawing showing a typical Johnson installation aboard an ore carrier.

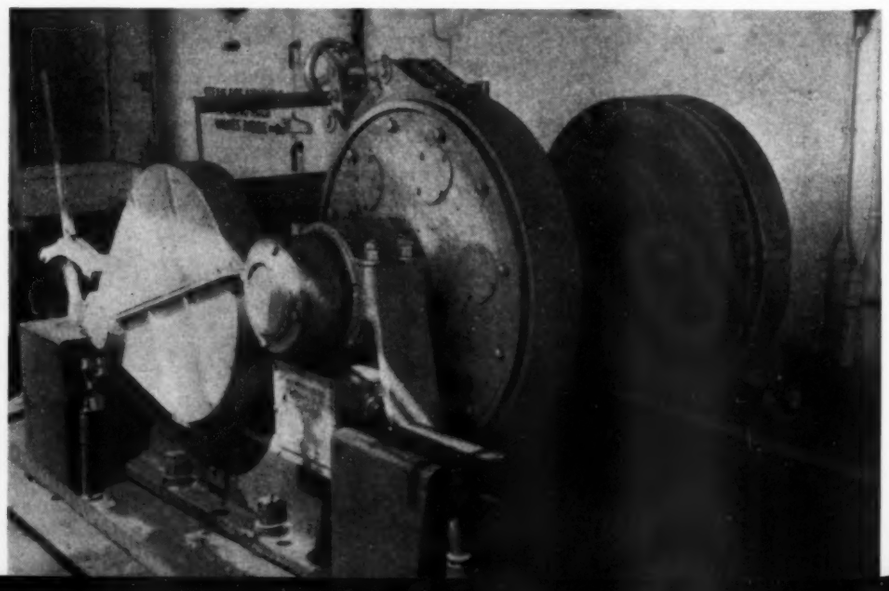
AN interesting development has been going on in our Great Lakes which was brought up recently when full information on the newly converted ore carrier *E. J. Block* was made public. Since speed is essential for successful operation in that type of haulage, Diesels have gained great favor. However, speed in loading and unloading these bulk carriers is also of vital importance. This involves speedy ship handling and mooring alongside a dock. One of the pioneers on the development of equipment designedf or quick and efficient mooring of these large ships is Almon A. Johnson. He believed that the time-honored system of ship mooring utilizing 12" hawsers and strong deckhands could be greatly speeded by the use of electric winches and stronger longer-wearing wire rope.

His main problem was that of making his winches flexible enough so that they would not part the wire when they were checking the irressistible force of a moving ship. Once he had solved this problem the way was clear for many other refinements in the art of mooring and ship handling.

Most of the ships fitted with the Johnson equipment are lake ore carriers ranging from 550 to 640 ft. in length with a cargo carrying capacity up to 20,000 tons. To see these huge vessels coming to a dock with no busy tugs pushing and hauling is an amazing sight for the salt water men. What is even more amazing to them is to note that the usual commotion on deck which accompanies many docking operations is absent. These seemingly strange phenomena are quite understandable when one considers the actual operation of the Johnson system. In place of heavy manila lines, shouting deckhands and clattering steam winches, you find in most cases a battery of six electric winches located fore and aft in groups of three, each group of three operated by one man stationed with a full view of the dock and lines. Once the lines are secured on the dock, and by the way the "lines" consist of 1⅛ inch wire rope, 600 feet long the winches take over. Two men can control the entire docking operation from their position at the control stands, taking in and paying out cable at will. The Johnson-Type winch is so designed that it will operate under predetermined tension limits. In other words, when the tension on the mooring lines becomes greater than the safe operating load, the winch will automatically pay out to ease the tension. Such an arrangement is the main reason for the success of the system. The winches will operate automatically to compensate for the vertical movement of the ship in canal locks, tides, or during unloading, always keeping the same tension on the mooring lines. When coming into dock the winches will check the movement of the ship, automatically easing up if the tension becomes too great.

Johnson control stand permits the operation of three winches by one operator.

Electric mooring winch aboard ship. This winch will pay out and heave in automatically to maintain proper tension on lines.



TROUBLE SHOOTING . . . . . WITH AN INDICATOR

PART II

By DR. P. H. SCHWEITZER, *The Pennsylvania State College*

Cold Cards

Sometimes an indicator card is taken from an engine cylinder with injection cut out. The purpose is to check compression. Fig. 16 shows a compression card, frequently called cold card, on pressure volume and time basis. It will be noted that the compression line and expansion line intersect each other. If they were true adiabatics, the two lines would coincide. Actually there is always a heat loss through the cylinder walls which causes the compression line to rise less steeply and the expansion line to descend more steeply than the true adiabatic. Hence they intersect. Frequently it is advisable to take a cold card right after the "hot" diagram in order to locate the ignition point, see Fig. 17. The ignition point can be located by determining the point where the combustion line leaves the compression diagram. For obtaining top dead center point, a line is drawn parallel to the atmospheric line across the compression diagram. The top dead center position is the mid point on this line between the intersections with the compression and expansion lines.

Diagnosing Indicator Diagrams

In order to diagnose engine defects it is necessary to be familiar with the normal diagram of various types of engines. In Fig. 18, card *a* is from a modern solid injection, open chamber engine, card *b* from a precombustion chamber engine, card *c* from a swirl-chamber engine, card *d* from an air cell engine.

In a modern high speed solid injection engine with open combustion chamber (a), the combustion pressure rise is 250 to 400 lb. over the compression pressure. The rate (slope) of combustion pressure rise is 25 to 50 psi. per deg. The ignition point is several degrees before top center and is preceded by an ignition lag which is 5 to 10 degrees at low speed.

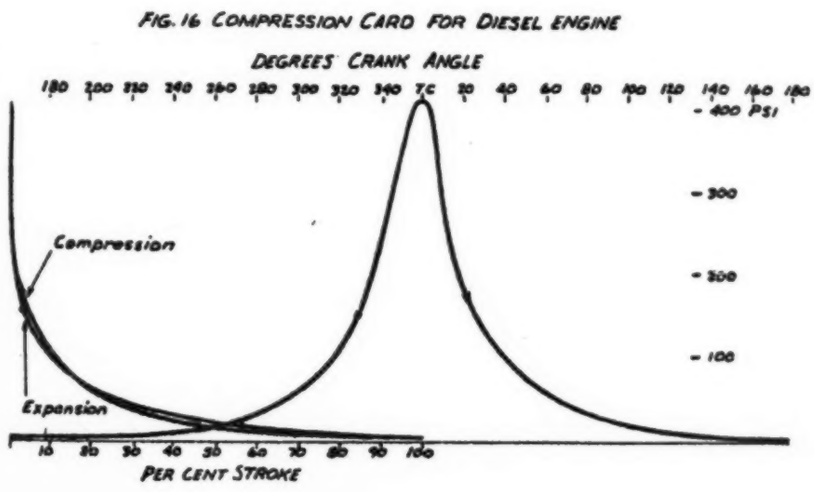


FIG. 16 COMPRESSION CARD FOR DIESEL ENGINE

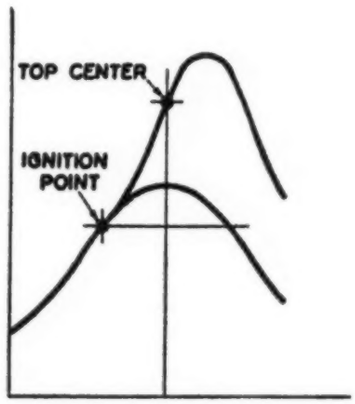
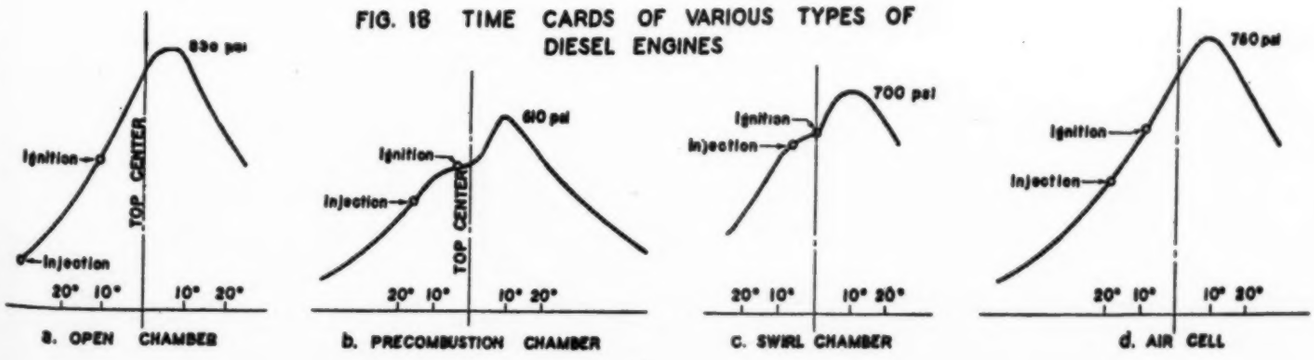


FIG. 17 LOCATION OF IGNITION POINT BY TAKING A COLD CARD IMMEDIATELY AFTER TAKING A HOT DIAGRAM.

FIG. 18 TIME CARDS OF VARIOUS TYPES OF DIESEL ENGINES



In a precombustion chamber engine (b), ignition in the precombustion chamber is only a few degrees before top center, the pressure line, therefore, shows a threshold at top center. The total pressure rise seldom exceeds 200 psi and the ignition lag is of the order of 18 deg. The ignition in a swirl chamber engine (c) is right at or very close to top center. Ignition being later the peak pressure is lower than in an open chamber and the ignition lag is as a rule shorter, from 6 to 12 deg, ordinarily and does not get much longer at high speed. In the air cell engine (d) peak pressures are moderate rates of pressure rise. Best ignition timing is several degrees before top center when the ignition lag is about 10 degrees. The peak pressures indicated are typical but higher and lower values are encountered.

In contrast, the time cards of air injection engines, shown in Fig. 19, show slight combustion pressure rise or no pressure rise at all (constant pressure cycle). Correspondingly, the peak pressures of air injection engines are lower, 500 to 700 psi. With proper timing the ignition occurs at or a few degrees before top center and diagrams have an appearance similar to those in Fig. 19. If the ignition timing is incorrect the appearance of the diagrams will be like shown in Fig. 20.

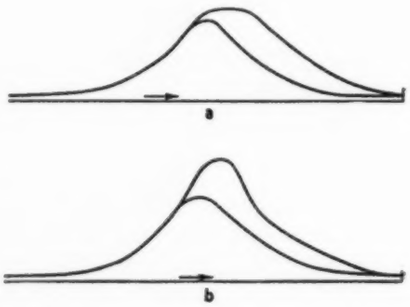


FIG. 19 TIME CARD OF AIR INJECTION ENGINE

a. Slow speed
b. Medium slow speed

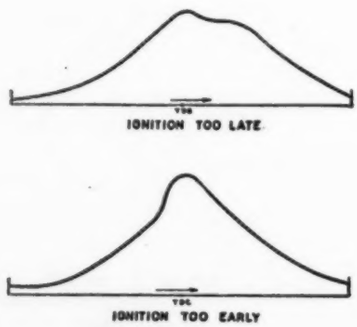


FIG. 20 - AIR INJECTION DIAGRAM WITH INCORRECT TIMING

The effect of injection timing in a solid injection engine is shown in Fig. 21, where three indicator cards are superimposed with standard, advanced and retarded timing. Advanced timing manifests itself by high combustion pressure, rough running and shock, retarded timing by low combustion pressure, increased fuel consumption and exhaust smoke.

The effect of compression ratio is visible in Fig. 22. The compression pressure increases with the compression ratio, but the effect on the peak pressure is not very pronounced. The explanation is that while the increased compression pressure tends to increase the combustion pressure, the simultaneous shortening of the ignition lag tends to decrease it due to the lower rate of pressure rise.

The effect of the fuel on the indicator card is shown on Fig. 23. The only fuel characteristics that appreciably affect the indicator diagram is the ignition quality, usually expressed by its cetane number. There is little difference in the appearance of the cards between 50 and 70 cetane fuels, but 30 cetane fuel gave a decidedly "rough" card, as evidenced by the high rate of pressure rise. In using fuels of still lower ignition quality misfire is likely to occur.

The effect of intake air pressure is shown in Fig. 24. If the intake air pressure is higher than atmospheric, the compression pressure will be higher in the same proportion and the combustion pressure will also be correspondingly higher.

In Fig. 25 three diagrams are superimposed which differ only in the setting of the control rack that means the load. It will be noticed that while at low load the maximum pressure is substantially lower, the difference in maximum combustion pressure between normal load and high load is insignificant. This is in line with the theoretical mixed cycle diagram.

A fairly widespread notion exists that the load can be judged by the height of the indicator diagram. For the Diesel engine that is not generally true. In Fig. 26 a set of indicator diagrams are shown where the maximum pressure at medium load is actually higher than that of heavy load.

The reaction of the maximum cylinder pressure to load changes will be largely determined by the type of injection system the engine is equipped with. Many engines have injection pumps where the load is controlled by the duration of the injection in such a manner that the fuel delivery always begins at the same time but the end of the delivery becomes later as the rack setting is increased. "Single helix" pumps ordinarily have this characteristic. Since maximum pressure generally occurs before the injection is fully completed, a further stretching out of the injection will not increase the maximum pressure. Neither will a reduction of load reduce the maximum pressure unless the reduction in load is so much that the injection is terminated before the cylinder pressure reaches its peak. A case of this type is represented by Fig. 26. While the light load card it is lower, the heavy load card is not higher than the medium load card. On the contrary a close examination will show that it is slightly lower. The explanation of this, by no means exceptional, observation is that the engine running at part load is considerably cooler which causes a longer ignition lag and a steeper pressure rise accompanied by a higher maximum pressure.

Another class of engines has an injection system in which injection occurs earlier when the rack setting is increased. The "double helix" injection pumps generally possess this characteristic. It has the advantage that it counters an excessive stretching out of the injection at heavy load, which is conducive to incomplete combustion. Such a case is shown in Fig. 27 ob-

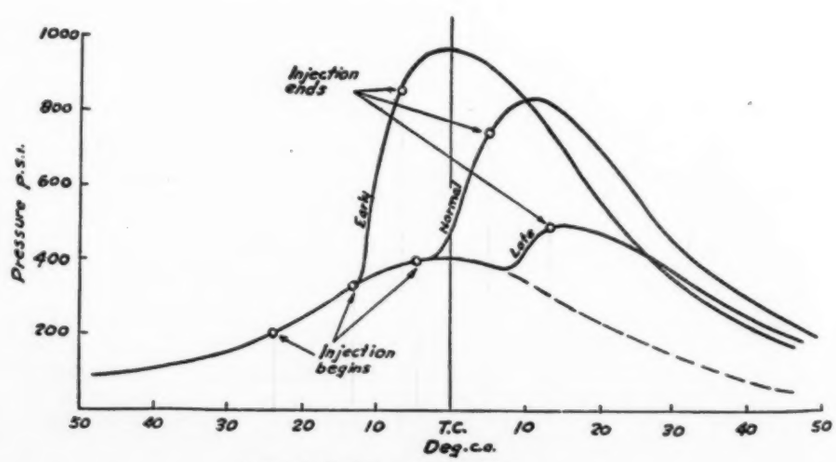


FIG. 21 EFFECT OF TIMING

tained from a marine engine. Variable injection timing is frequently found on marine engines, where speed and load increase together and both call for an injection advance for best efficiency. Marine engines, therefore, frequently are equipped with jerk pumps having a double helix on the plunger, so that a rotation produced by pushing the rack in both advances the beginning and retards the end of injection.

From the above it should be clear that it is not universally correct to take a clue from the peak pressure when cylinder load is estimated. At very light load the peak pressure is always low, but otherwise the peak pressure may increase or decrease with the load, or it may remain practically constant.

Balancing of Cylinders

A very useful service of the indicator is the balancing of the load of multi-cylinder engines. The load carried by the individual cylinders must be substantially equal. The indicator reveals the load conditions in the cylinder in a dependable manner. By comparing the individual indicator cards one can pick out those cylinders that carry less load and one can frequently even tell from the card why it carries less load.

There are several ways to judge the cylinder load from its indicator card. The indicator diagram which corresponds to the heavier load is always "fatter." The load increases the width of the card. On a time card (or offset card), the safe thing is, however, to count only the width (crankangle at a given pressure, say 400 psi) from top dead center forward in the direction of rotation. The area before top dead center corresponds to negative work. With this qualification the fatter diagram always represents heavier cylinder load. If the injection timing was left unchanged, the heavy load also causes earlier ignition which can be recognized on the indicator diagram by the absence of a dip or less dwell (threshold) in the pressure immediately before ignition occurs. Close to full load longer ignition lag also causes a steeper rate of pressure rise.

After the indicator has shown unbalanced load conditions in a multi-cylinder engine, it can further help to diagnose the reason for it. If there is a loss of compression because of poorly seating valves or untight piston rings or blown cylinder head gasket, it will show up in the time card by lower compression pressure preceding ignition. Incorrect injection timing can be ascertained from the position of the ignition pressure rise. A close inspection of the indicator card would also reveal delayed burning as would be caused by a defective nozzle. This latter can, however, often more promptly be ascertained by exchanging nozzles between cylinders.

It is a widespread malpractice among Diesel engineers to "balance" the load by adjusting the rack whenever the exhaust pyrometer shows that some cylinder is out of line. A better understanding of the indicator diagram should help in proper diagnosing of the trouble and applying the proper remedy.

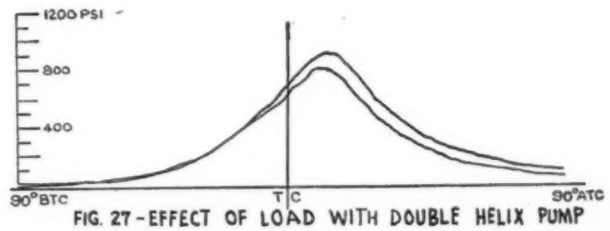
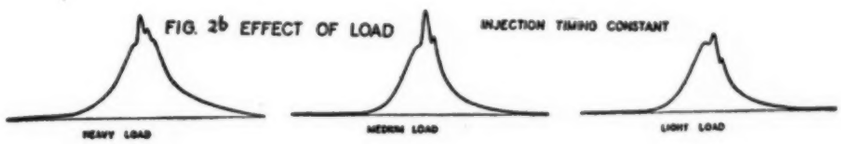


FIG. 27 - EFFECT OF LOAD WITH DOUBLE HELIX PUMP



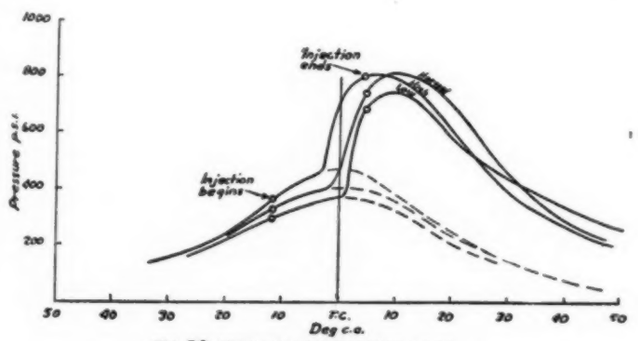


FIG. 22 EFFECT OF COMPRESSION RATIO

High Compression Ratio 17:1
Normal Compression Ratio 15:1
Low Compression Ratio 13:1

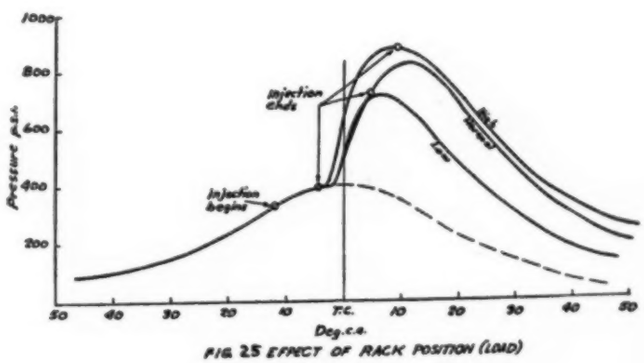


FIG. 25 EFFECT OF RACK POSITION (LOAD)

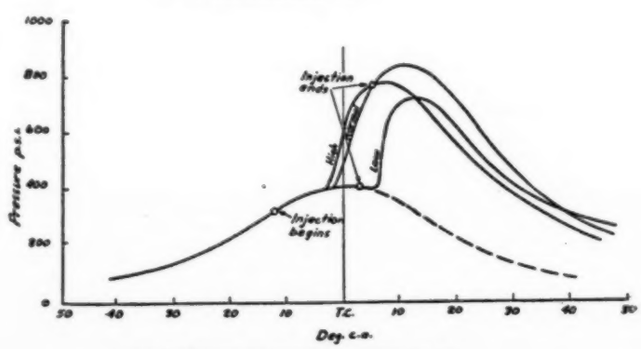


FIG. 23 EFFECT OF IGNITION QUALITY OF FUEL

High Ignition Quality..... 70 Cetane Number
Normal Ignition Quality ..... 50 Cetane Number
Low Ignition Quality..... 30 Cetane Number

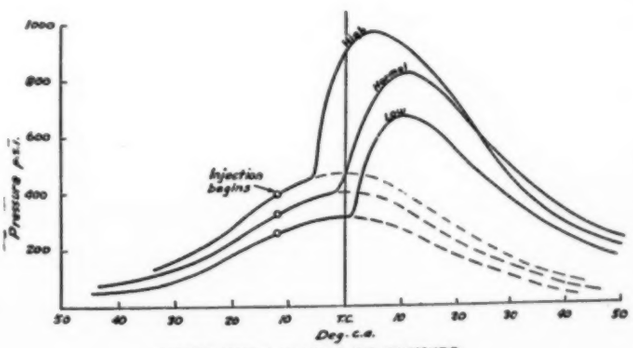


FIG. 24 EFFECT OF INLET AIR PRESSURE

Injection duration adjusted to maximum with clear exhaust.
High inlet air pressure corresponds to supercharging.
Low inlet air pressure corresponds to throttling.

GENERAL PURPOSE MACHINE SPEEDS DIESEL CONSTRUCTION

By E. K. MORGAN

MAJOR producers of large Diesel engines for stationary, marine and railroad use are constantly confronted with machining problems that tax the imaginations of their best production men. Typical Diesel plant jobs include precision machining operations on combination frame and bed plates; boring cross girders that must support main bearings; and the machining of fabricated and cast cylinder blocks for accurate assembly.

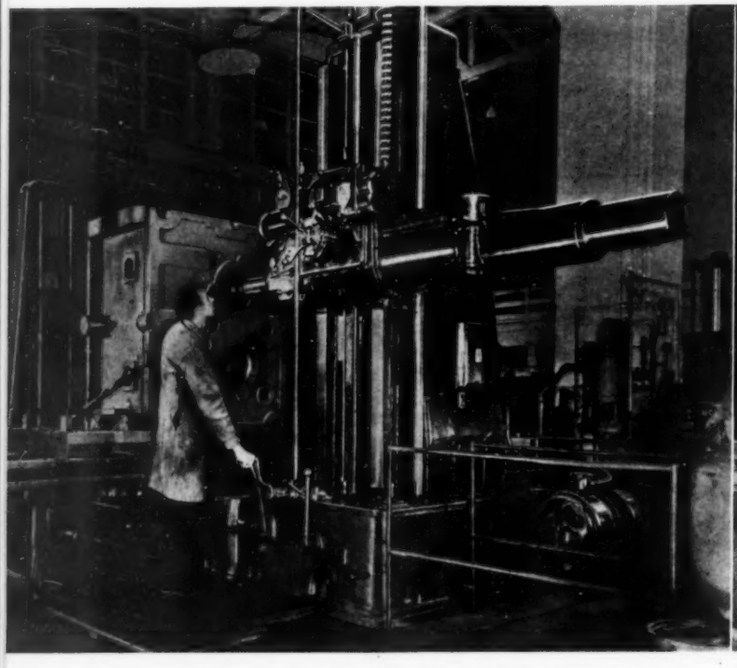
The difficulties encountered in production problems such as these are increased in direct ratio to the size of the engine component being machined. However, when constant demands were made to produce more and more Diesel engines during the war, progressive manufacturers learned new methods of handling such difficult jobs on general purpose equipment.

Prior to the war, many single purpose machines were used in Diesel engine manufacturing plants for individual operations. Under the urgent war program, however, it was found that one general purpose machine would frequently perform a variety of machining operations in less time and often more accurately than several single machines because it was unnecessary to shift work.

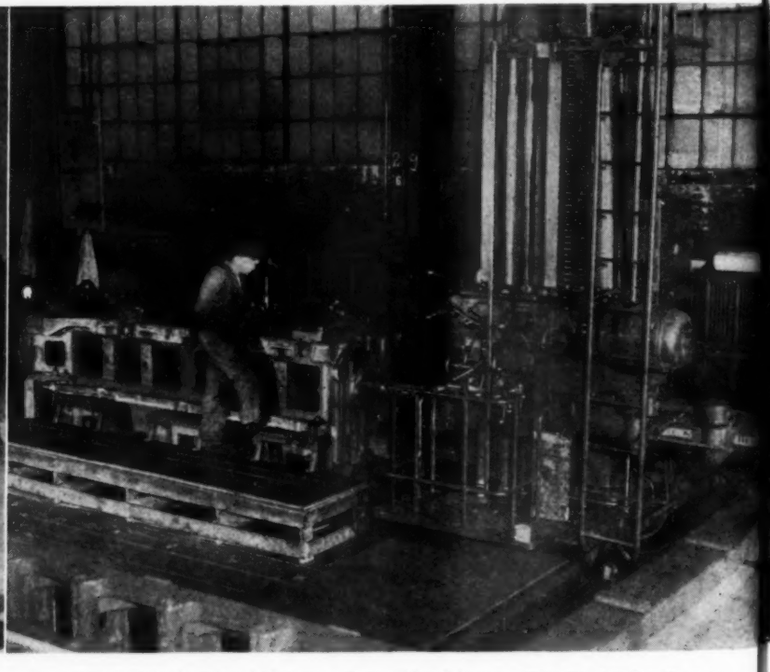
In selecting general purpose equipment, it was necessary to obtain a machine capable of performing numerous milling, drilling, boring, reaming, counterboring, facing and backfacing operations. Further, it was essential that this machine have the capacity to handle all engine components, regardless of size or shape, length, width or height.

A horizontal boring, drilling and milling machine is especially useful in meeting such requirements. First, being a machine tool capable of performing precision operations, it is well suited for all boring, drilling and reaming operations. Having the necessary power, this machine is also used for milling and facing of

* *General Sales Manager, Giddings & Lewis Machine Tool Company, Fond du Lac, Wisconsin.*



An extended saddle with saddle supports and auxiliary runways is used to support this 5-ton Diesel cylinder head. Diversified machining operations such as drilling, boring and milling are easily performed on all six faces of the casting.



Boring the main bearing holes on a large Diesel frame. The boring bar is supported by means of the internal holding fixture shown. All required dimensions and alignments are held through the built-in accuracy of the machine and the boring method followed.

engine frames, bases, heads, pans, manifolds, yokes, cranks and other parts.

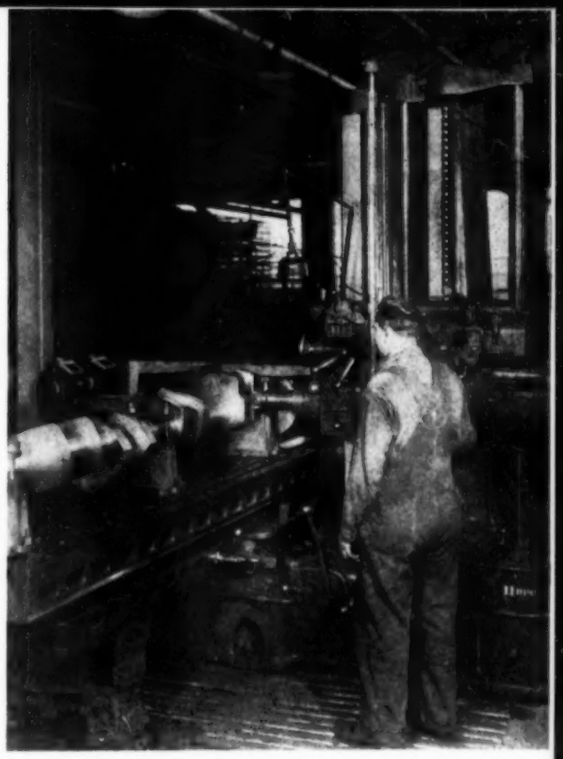
Undoubtedly, the most advantageous feature of the horizontal boring, drilling and milling machine is its *open construction*, which permits the workpiece to extend in any plane to facilitate machining. Thus, when necessity demands, an unusually long engine block or bed can be mounted on the floor plates of a floor type machine, or on the table of a planer or table type machine. An auxiliary supporting device or table is often used on the latter.

Machining of Diesel engine components is best shown by actual operational data and photographs. Here is a list of the major engine parts which are produced on a single horizontal boring machine in one plant:

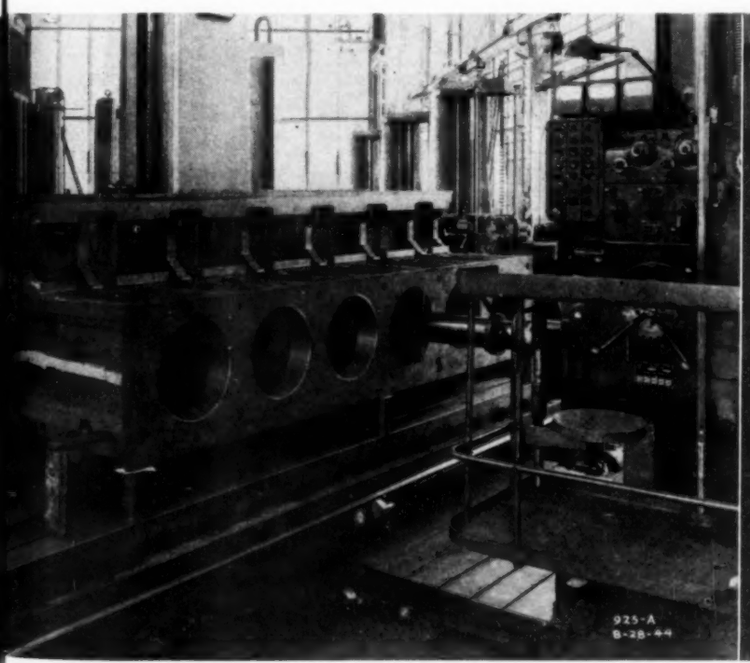
1. *Crankshafts:* webs milled
2. *Bed plates:* both ends milled
3. *Crankcase:* four sides milled
4. *Cylinders:* exhaust and intake ports milled; *water jacket clean out bosses and air compressor bosses* all milled
5. Milling operations on *manifolds, yokes, clutch bases, bearing caps and brake bands* are performed.

Perhaps one of the most outstanding jobs on a Diesel engine component is that of machining a 5-ton head casting . All six sides of the casting are machined. In addition, complicated boring operations are performed. The manufacturer of this large Diesel engine states that the horizontal boring machine offers the only practical way to complete all operations on the huge head.

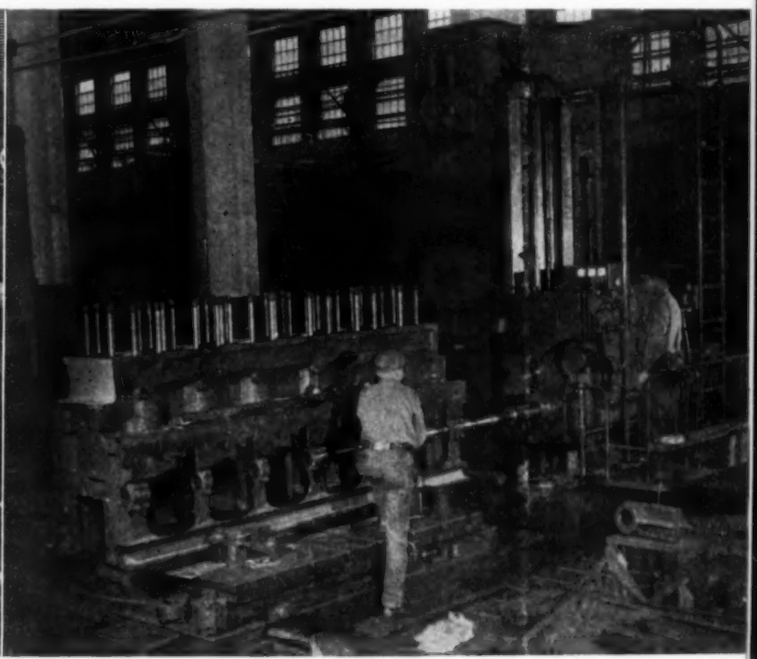
To increase the flexibility of the horizontal boring machine even further, it can be equipped with suitable attachments such as rotary tables, overarm arbor supports, angular milling heads and continuous feed facing heads. When these accessories are used, often only a single setting of the work is necessary. Thus it is possible to reduce overall production time and eliminate possible cumulative error which would be the direct result of moving the part from one single purpose machine to another.



Machining the crankshaft faces of a large marine Diesel. A negative rake milling cutter is used to speed production and at the same time produce a mirror-like finish.



Boring the cylinders of a large Diesel engine. A planer type machine is used and bore center distances are determined by machine scales and verniers. This is typical of many attachments developed to adapt general purpose machines to perform special operation.

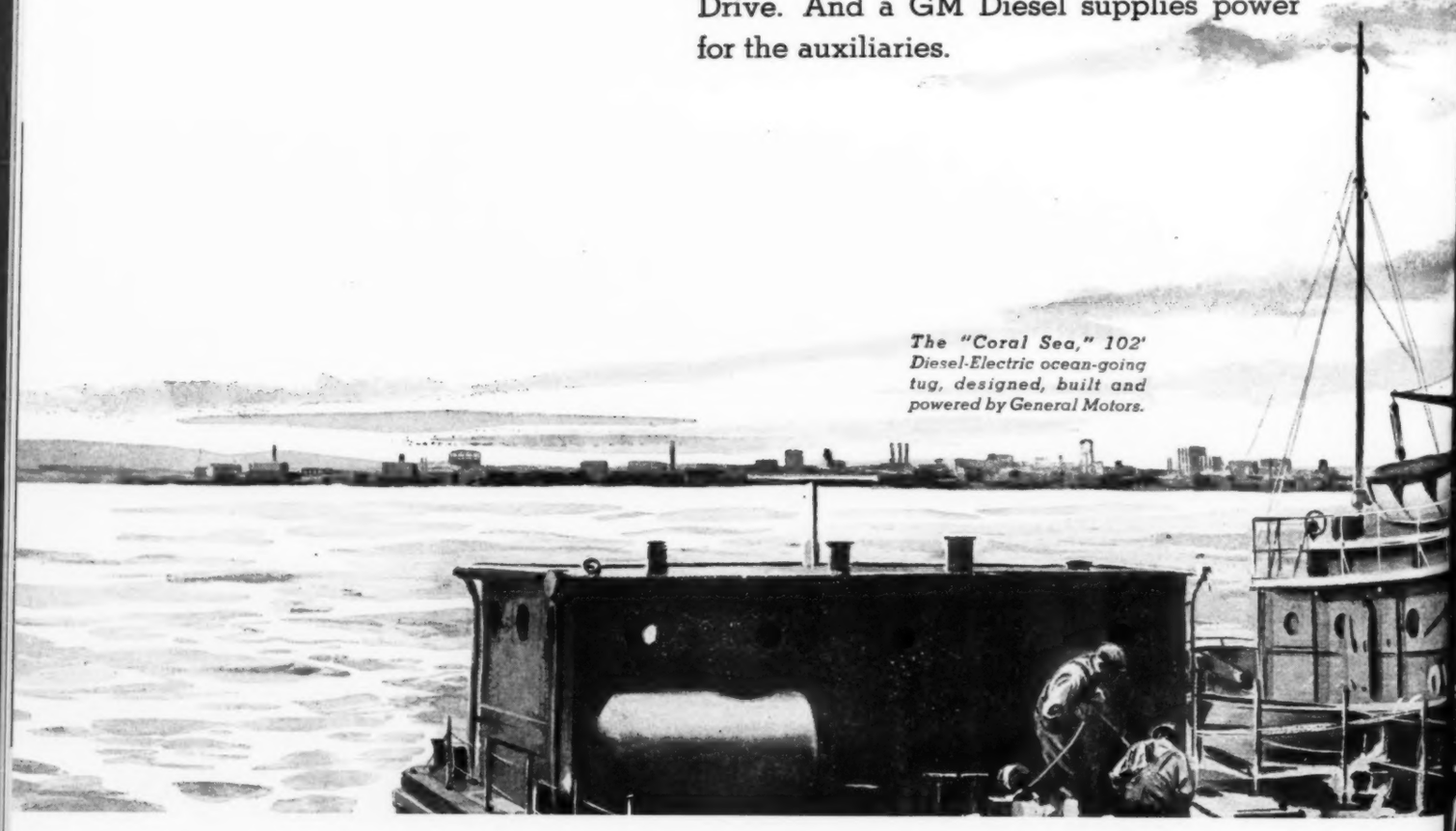


Boring camshaft bearing holes on a floor-type machine. After each bearing is bored, it is then bushed to support the boring bar. A rotary table is used to index the engine frame for subsequent machining operations.

Sister to a Famous Wa

The new "Coral Sea" is a sister ship of the tug "Intent," famous for her unescorted dash from the U. S. to the Red Sea for war salvage work.

Like the "Intent," the "Coral Sea" is powered with General Motors Diesel-Electric Drive. And a GM Diesel supplies power for the auxiliaries.



The "Coral Sea," 102' Diesel-Electric ocean-going tug, designed, built and powered by General Motors.

CLEVELAND DIESEL ENGINE DIVISION

CLEVELAND 11, OHIO

GENERAL MOTORS

ENGINES FR
150 TO 2000

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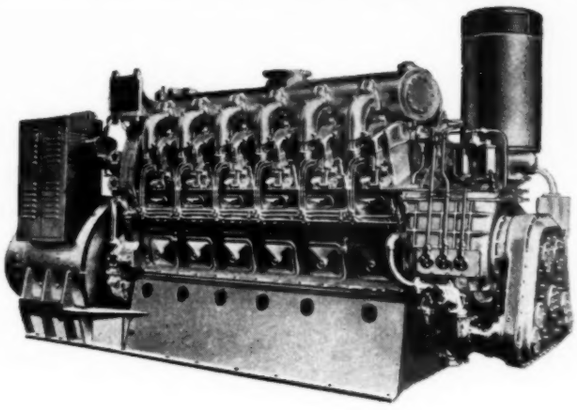
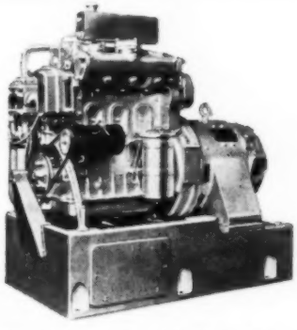


The "Coral Sea" has a 12-cylinder 2-cycle, General Motors Diesel for main propulsion power.



Auxiliary power is provided by a General Motors 3-71 2-cycle Diesel engine.

CORAL SEA

GM
GENERAL MOTORS
DIESEL
POWER

NES FR
2000

The "F. E. Lovejoy," 178 ft., 1,600 ton Diesel freighter, is unique in its cargo handling ability.

PUGET SOUND FREIGHTER H

By CHARLES F. A. MANN

LATEST in the unique fleet of sound and coasting freighters operated by the Puget Sound Freight Lines of Seattle, is the husky, beautifully-designed Diesel freighter *F. E. Lovejoy*, completed by her builders, Reliable Welding Works of Olympia, and turned over to the owners in the middle of July, for service between Seattle and Tacoma, Wash., and Powell River, B.C. Some fifty newspapers will have their thirst for scarce newsprint slaked in more dependable, swift fashion, because of the speed and novel cargo handling ability of the 8th of a series of novel craft evolved 25 years ago, to replace the fast-vanishing Puget Sound packet fleet.

No more progress in the application of Diesels for the complete replacement of steam power can be found on any waterway or maritime region in the world than on Puget Sound. The 1200 hp. Fairbanks-Morse-driven *F. E. Lovejoy* is the last of a long line of nautical experiments on Puget Sound, wherein Diesel propulsion is the 100% answer.

Until World War I, Puget Sound lived, breathed, hauled its mail, milk, express, daily papers and passengers in speedy sound-type packets. Many had large power installations. Many carried fancy staterooms for 75-100 mile overnight runs. All carried freight stowed and unloaded the hard way—husky stevedore-crew members using 2-wheel hand trucks and a chain hook, hauled up and down splintery wooden gangplanks by the trusty old steam donkey and a rigging of 2 or 3 pulleys. In those days, Puget Sound tugs were steam-propelled. Since there were scarcely no roads and no auto traffic, except in the larger cities, there were no ferries.

Up to the beginning of World War I, Puget Sound, in its 200 mile length, and 3500 mile shoreline and between its 500 islands, lent itself to primarily a north-south Express Packet trade.

Ten years after 1917, 90% of the steam packets were scrapped and the rest were rounding out their last stand against a fast-growing Diesel ferry fleet. Some 30 of once-famed Puget Sound packets, not a few of which were built on the Great Lakes and came via Cape Horn or Pana-

ma to Puget Sound, were converted, sponsored out and made into fast Diesel ferry boats. The distinctive change was that maritime traffic on Puget Sound reversed itself, and became primarily a swift east-west movement, instead of north-south. Second major change, was the division between passenger and freight traffic, that formerly were handled together. There developed two distinct sound movements—one, Diesel ferry boats and the other, Diesel freight boats—both highly specialized for their jobs.

So, in 1919, Puget Sound Freight Lines was born in the brain of the late Captain F. E. Lovejoy. "Cap" Lovejoy dreamed of a slow-moving, shallow draft, large capacity, yet small sound freighter, Diesel-driven, to wring the last ounce of economy and keep freight rates low.

He also played with the idea of a vertical freight elevator, to lift or lower freight from docks of varying heights without the use of the clumsy inclined gangplank.

When Captain Lovejoy built his first "big" ship, the *F. H. Marvin,* he installed a pair of Fairbanks-Morse Diesels, 100 hp. each. The latest ship, *F. E. Lovejoy,* carries a 1,200 hp. Fairbanks-Morse Diesel.

Captain Lovejoy stuck to his idea that for heavy cargo handling, at fast speeds, economically, and with equipment a new 3rd Engineer could fix with a wrench, a screwdriver and a pair of pliers, and which a deckhand simply could not damage, absolutely nothing could replace the soft cushion of gas behind a piston.

So, why not use compressed air in a conventional loggers' donkey engine, and in a cargo boom hoist and on an anchor windlass? That would provide all the economies and advantages for this particular job of slogging freight up and down a towering hoist on his freight boats. Next, what better source of power to supply compressed air has ever been invented than a small Diesel engine hooked directly to an air compressor?

And so for 27 years, the Puget Sound Freight Lines fleet have had Diesel-pneumatic deck machinery, which astounds the observer, even in this electric age. With its rugged simplicity and dependability this equipment is able to show cost and investment figures that tend to rule out electric deck gear for this class of service. For example, in the *F. E. Lovejoy,* enough stored compressed air is available to take 3 ton loads up 40 feet in the freight elevator, 20 round trips, without even starting the Diesel compressor! And remember this is a husky logging-type air-operated hoist—not a toy. Compressed air, as a type of stored power, for this job, costs less, occupies less space than any electric job.

On the *F. E. Lovejoy,* as on the 6 other units of the fleet, loading is accomplished with 3-ton Clark lift trucks, which pick up loaded lift boards or rectangular skips, on pier or in the boat, and carry them across a transfer plank to the ship's elevator. The elevator is then adjusted to the deck level, and the lift truck stows the boards in place. Reversal of the process unloads the ship. The lift trucks easily handle loads to 9 ft., if necessary, to permit double piling and full headroom utilization. The sensitive control valve permits fast hoisting or descent, and braking against air pressure. The lift trucks are stored aboard ship.

This system of freight handling is swift, economical and applies to everything that can be piled on lift boards, from heavy rolls of paper to groceries, drygoods and baled pulp, plywood and shingles. Its fast, cheap and flexible, and the foundation of not only the company's success, but the foundation of the revolution in freight handling on Puget Sound.

The "F. E. Lovejoy"

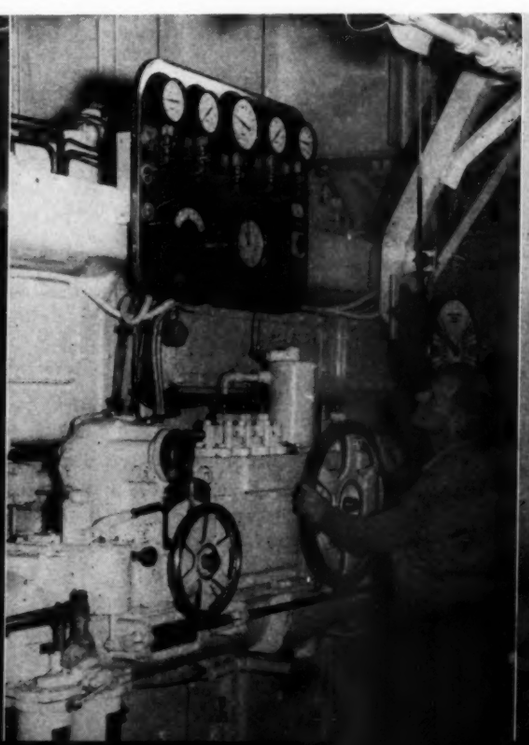
The vessel is ruggedly constructed of welded steel throughout, and is 178 ft. 4 in. x 36 ft. x 15 ft. depth and is of 1,600 tons displacement when loaded with 900 tons of cargo.

She was designed in a series of progressive evolutionary steps based on two factors: the company's experience to date, and the needs

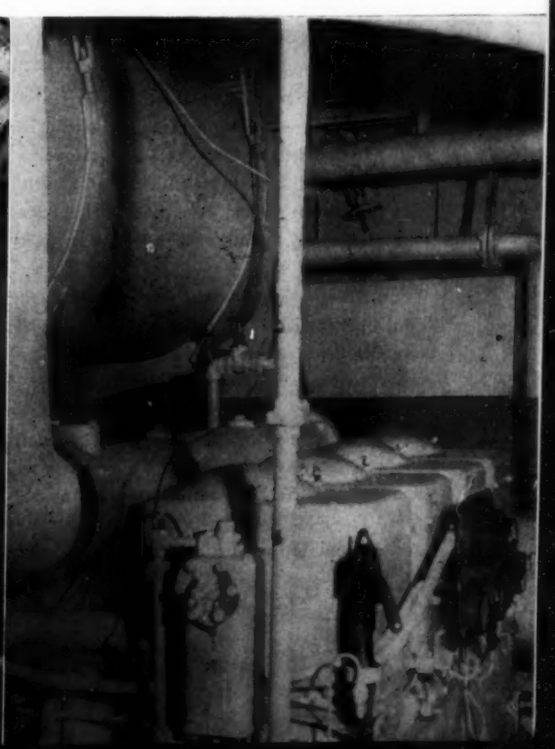
R HAS UNIQUE FEATURES

Capt. Henry Hellman, master of the "F. E. Lovejoy," checks Sperry steering gear.

Chief Engineer Walter Sargent at the controls of the 1200 hp. Fairbanks-Morse main Diesel.



View of the 135 hp. Atlas auxiliary Diesel. An air storage tank seen upper left.



of the particular service in which she was to operate. Carl J. Nordstrom, noted Seattle naval architect, distilled the dreams and experience and forecasts into working plans, and Al Lewis' Reliable Welding Works at Olympia built the ship. Western Boatbuilding Co. at Tacoma built the top deckhouse and it was trucked to Olympia for welding in place. The main deckhouse, freight space and hull are all welded steel. The two huge freight decks are paved with regular highway type asphalt paving, 2 inches thick laid over the steel deck plates.

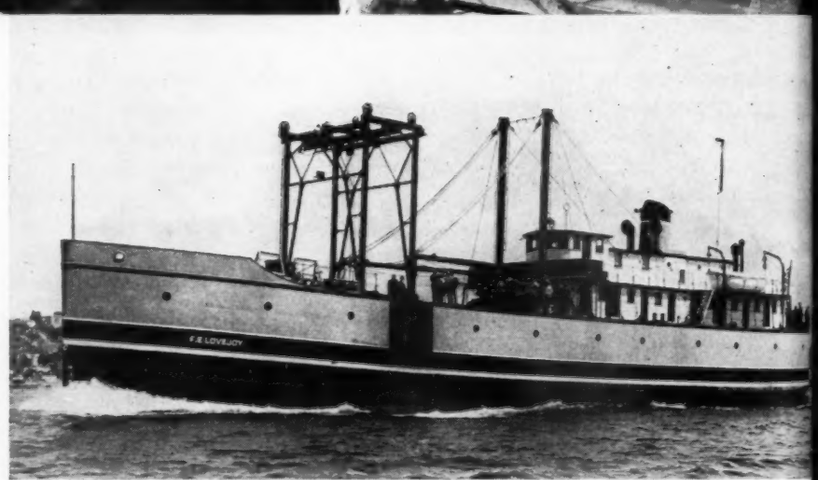
Starting with the lower freight hold at engine room level, forward, is the forepeak and chain locker, on top of the forward ballast tank. Next comes another water ballast space, directly over which is the freight hoist and some of the compressed air receivers. From this space back to the engine room bulkhead is the ship's double bottom space, for fuel and salt water ballast, which supports the lower cargo space. The machinery space is located well aft. There is no double bottom under this area. The after peak tank is for water ballast only.

The main cargo deck extends from the stem of the ship, clear back to the rounded stern, with only the cargo elevator and engine trunk aft as obstructions. Likewise this area is well lighted and has paved decking. The open main deck has a mooring bitt and compressed air anchor windlass and mooring winch, and plenty of open deck for long deckloads of pipe, timber and vehicles. A husky cargo winch, likewise air operated, for handling cargo boom loads, is followed by elaborate crew's quarters, day room, engine trunk, owner's stateroom, cook's room and a commodious galley and dual messrooms far aft. The galley has large electric ice box, oil range, and two dining tables.

The pilot house and texas are of wood construction, and house the master, mates and quartermasters and two steel lifeboats are swung outward from this area. The vessel has neat lines and is built to the American Bureau's class for limited coastwise service. She does about 11½ knots with the Diesel.

Not only has everything been provided for efficient operation of machinery and handling of cargo, but every comfort for the crew of 17 has been provided.

The propulsion plant features a big 6 cylinder, 16 in. x 20 in. Fairbanks-Morse direct reversible, 2-cycle Diesel, delivering 1,200 hp. at 300 rpm. The F-M Diesel carries an F-M pyrometer and Weston tachometer on the control board



Top picture shows "F. E. Lovejoy" loading at Bellingham, Washington. Note use of steel apron for truck operation. Lower picture shows the "Lovejoy's" cargo elevator rig as she moves down the Sound.

and Nugent lube oil filters and a Michiana lube oil clarifier is provided. The main engine carries a 10 kw. generator belt-driven to provide normal lighting for the ship while underway, also a V-belt driven auxiliary air compressor to provide starting air. The main Diesel carries most of its own auxiliaries, including circulating water pump, single cylinder, double acting scavenging pump, fuel and lube pumps, and a large Burgess silencer-spark arrester is carried in the stack directly above the engine. When in normal operation, the belt driven 10 kw. Fairbanks-Morse 110 volt generator and self-contained air compressor, supply ample electricity for all major ship's operations, and the main auxiliary Diesel can be shut down entirely until the actual use of the pneumatic deck machinery begins. A 56 cell Exide battery set, plus the output of the main Diesel's small capacity generator, provides sufficient power for all controls, steering gear, lights, signals, and the Deming salt and fresh water sanitary systems. Four starting air bottles provide air at 250 psi., and each are 30 inches x 96 inches in size, providing almost unlimited starts in delicate maneuvering.

The auxiliary power plant centers around a 4 cylinder, 9 x 10½ inch 135 hp. Atlas Imperial Diesel engine, which delivers its rated output at 514 rpm. Directly coupled to it, via an automatic clutch, is a large two-stage, two cylinder,

water-cooled Sullivan air compressor. An Alnor pyrometer and a Weston tachometer are fitted to this Diesel. The Sullivan compressor, with its water cooled air intercooler, delivers 408 cfm. at about 125 lbs. pressure, delivered to five large air reservoirs for the pneumatic system. A pressure drop of 5 lbs. automatically throws in the compressor clutch. Also, driven off this unit, is a 23 kw. Fairbanks-Morse 110 volt generator, to provide standby electric power for the ship's deck floodlighting system, extra battery charging at night. A 7½ hp. Gardner Denver motor-driven air compressor for charging the main Diesel's starting air bottles is also hooked into this system. After a prolonged shutdown, the auxiliary compressor can be run briefly on the battery set, then the auxiliary Diesel started and then, with sufficient air, the main Diesel can be turned over.

A De Laval 3 x 4 split case fire and bilge pump capable of delivering water at 125 lbs. pressure, is likewise clutch and belt driven off the Atlas auxiliary set. The main electric switching panel for the ship is by Trumbull electric, and carries a complement of Weston instruments. Cutler Hammer motor controls are fitted throughout, and a 4 inch Fairbanks-Morse 700 gpm. ballast water pump is provided, as well as a Crane oil-fired heating boiler.

Top picture, taken aboard the "F. E. Lovejoy," shows a group of officials. Left to right they are Capt. Henry Hellman; Carl J. Nordstrom, naval architect; Clarence H. Carlander, President of the company; Al Lewis, Builder; Howard Lovejoy, son of the founder; and Alfred Solibakke, Marine Supt. for the company. Lower picture shows one of the Clark trucks working aboard ship.

The main Diesel carries a single Kingsbury thrust bearing and the Doran propeller is 94 x 54 inches. A Sperry No. 2 electric steering engine is fitted, with easy conversion to manual steering effected by a knob located on the steering wheel. The steering engine is located under the upper deck, inside the engine casing. A radiophone and a radio direction finder is also installed for safe navigation.

The pneumatic deck machinery is typical northwest logging type, of extra rugged construction. The telescoping I beam for handling the steel loading apron, is a patented feature, and mounted atop the highest point of the frame in which the freight elevator travels, and is capable of extending 20 ft. each side of the ship, to handle the chain hoist that lifts the steel plank into position.

The crew's quarters are plywood and enamel finish, and the whole standard of outfitting is in line with best passenger ship practice.

Puget Sound Freight Lines now operates the following Diesel freighters, each bearing the indelible, characteristic stamp of the company's design: *Warrior,* 156 ft. long, twin 200 hp. Atlas Diesels; *Indian,* 165 ft. long, 500 hp. Atlas Diesel; *Seatac,* 120 ft. long, 300 hp. Fairbanks-Morse Diesel; *Skookum Chief,* 125 ft. long, twin 180 hp. Washington Diesels; *Belana,* 105 ft. long, 240 hp. Fairbanks-Morse Diesels; *F. H. Marvin,* 125 ft., twin 100 hp. Fairbanks-Morse Diesels.

The company owns its own docks in Bellingham and Olympia, nine 7-ton trucks to serve Grays Harbor, five 16-ton tractors; 46 power lift trucks and some 9000 cargo skips and boards. in addition to much other equipment.

Succeeding Capt. F. E. Lovejoy as founder, after his death in 1940, is Clarence H. Carlander, president. Other officers are George W. Foss, vice president; Edith R. Lovejoy, secretary-treasurer; Alfred Solibakke, marine superintendent; J. Knox Woodruff, operating manager; George B. Cooper, purchasing agent. Assisting Mr. Carlander is Howard Lovejoy, the founder's son.

NORWEGIAN SHIP "ESTRELLA"

By BRUCE C. SISSON

THE Norwegian Merchant Fleet can greet a long lost sister after her two year absence in America. The *Estrella* will go home with an Americanized engine room complete to the last detail. She will be the first Norwegian ship to be equipped with American Diesels.

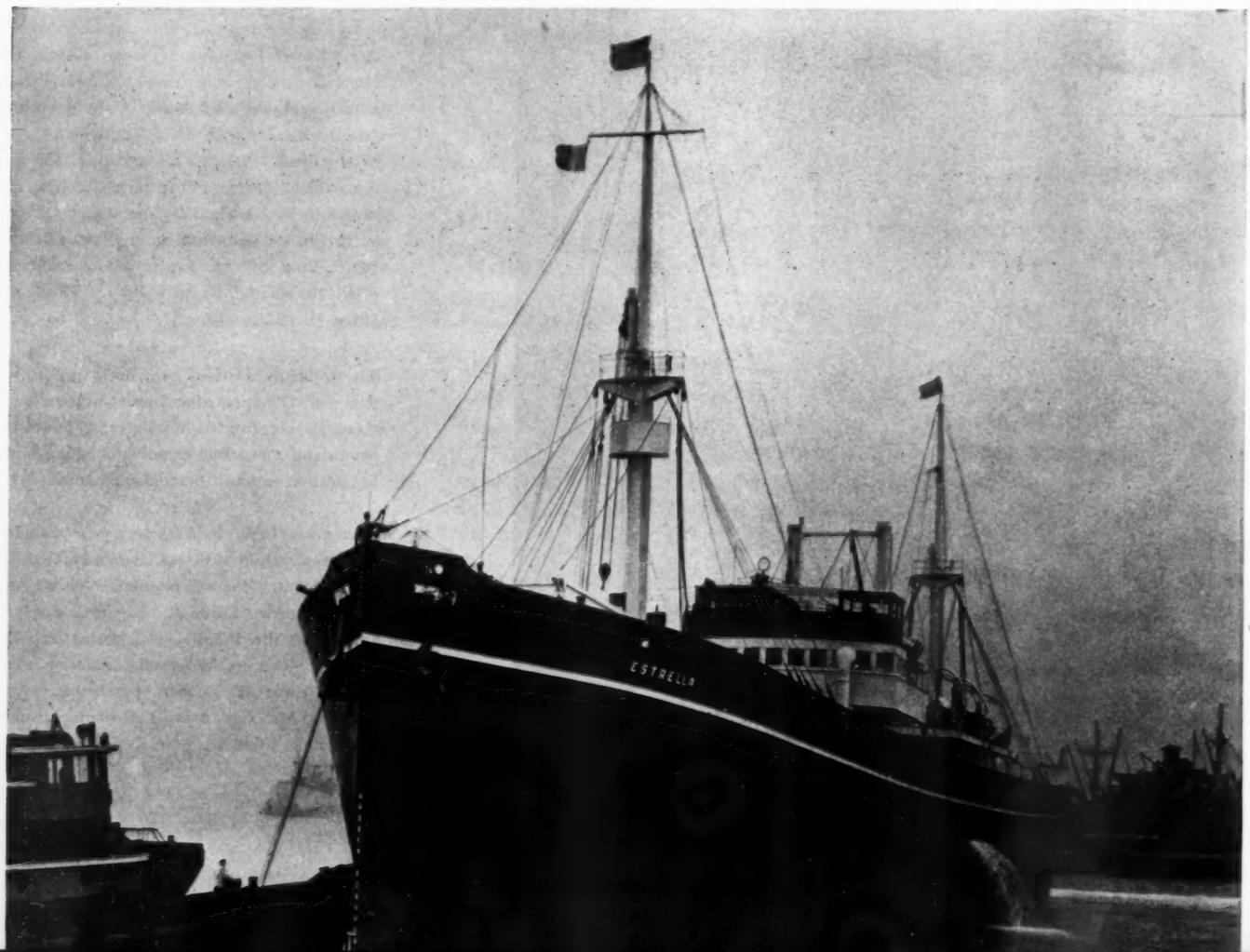
The *Estrella,* 3,888 gross tonnage, was built in Rotterdam in 1920 and was outfitted with the best Diesel engines available at the time. She plied her trade in the Mediterranean until the outbreak of hostilities in 1939, when she was taken over by the Allies for war purposes. She served well under wartime conditions, until overwork and hard usage had nearly broken her heart. She was laid up in Montreal with badly worn and broken down engines and a damaged hull, waiting for her owners to put her back in shape.

With the end of the war in Europe, her owners, the Odfjell Line of Norway had her towed to the Bethlehem Yard at Brooklyn, New York, for a complete hull and machinery overhaul. After an extensive inspection, it was decided that the entire engine room be stripped and new machinery installed.

The Odfjell Line's Superintending Engineer, C. Anda, a veteran marine engineer, got together with Henrik Greger as consulting engineer, and selected the machinery to be installed. Mr. Greger drew up plans for the engine room and work was begun. The speed with which the job was done reflects credit on all those who were on the project. In six months an entire engine room was stripped, new engine foundations were built, and entirely new machinery was installed. The greatest task which was successfully accomplished was the procurement and delivery of all the machinery within the period of overhaul availability.

A glance down into the engine room reveals the excellent judgment and planning in the location of the machinery. The big Hamilton Diesels dominate the picture. There are two of these 6 cylinder, 2 cycle, 1400 shp. Diesels each turning a propeller at 140 rpm. at rated speed. It is a direct drive installation. Next, one notices the 3 auxiliary Diesels, which generate ship's service power. They are 6-cylinder Winton-General Motors Diesels and drive Siemans-Schukert 130 kw. generators at 450 rpm. These are located outboard of the main Diesels, two being on the starboard side and one on the port. The pumps are mounted near the forward bulkhead of the engine room, and are spaced for easy access. Quimby, Gardner-Denver, McGowan, Roper, and Deming pumps are installed. Two De Laval centrifuges are located amidships forward of the main engines, one for fuel and the other for lube oil purification. Next to the skin of the ship on both port and starboard sides are the lube oil filters for the auxiliary Diesels, the emergency compressor and

The Norwegian ship "Estrella" shown leaving the Bethlehem yard at Brooklyn, N. Y., after her new Hamilton Diesels were installed.



BOASTS AMERICAN DIESELS

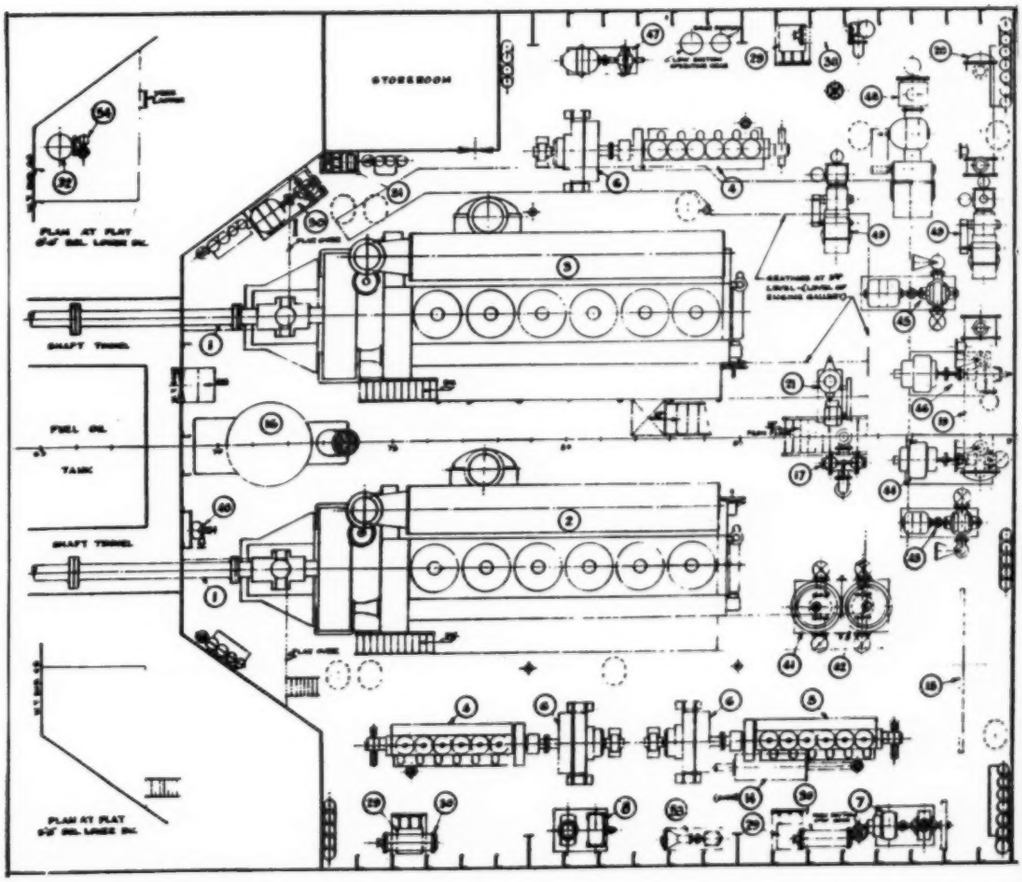
the Hill 15 kw. emergency Diesel generator.

The second engine room level finds the Ingersoll-Rand air compressors and the starting air banks. Lube oil storage tanks are located on the forward bulkhead, while on the port side there is a fully equipped machine shop. At this same level is the Maxim air intake silencer. At the third level are the fuel oil service tanks.

The *Estrella* has an expert engineering force, well trained in Diesel operation. Several of its members have businesses in Norway which they direct "in absentia" while serving with the Odfjell Line. We watched them at work on the *Estrella's* trial trip down the Jersey Coast. The Chief Engineer was taking indicator cards of the main engines, the three assistants were at the controls constantly checking the new American-made instruments for variations in tachometer readings, temperatures, and pressures.

The list of instruments installed aboard the *Estrella* is impressive. Among the concerns represented are the Durant Manufacturing Co. which supplied the engine counter; Herman Sticht Co. supplied the tachometers; gauges were produced by Ashcroft and National Gauge Co. The exhaust pyrometers were supplied by the Alnor Company.

While the *Estrella's* engine room was being rebuilt, the shipfitters at the Bethlehem Yard reconditioned the vessel's bottom which had been damaged and then sandblasted the whole hull down to bare metal and repainted it. Crew quarters were rebuilt and the galleys refitted. The *Estrella's* electric driven deck machinery



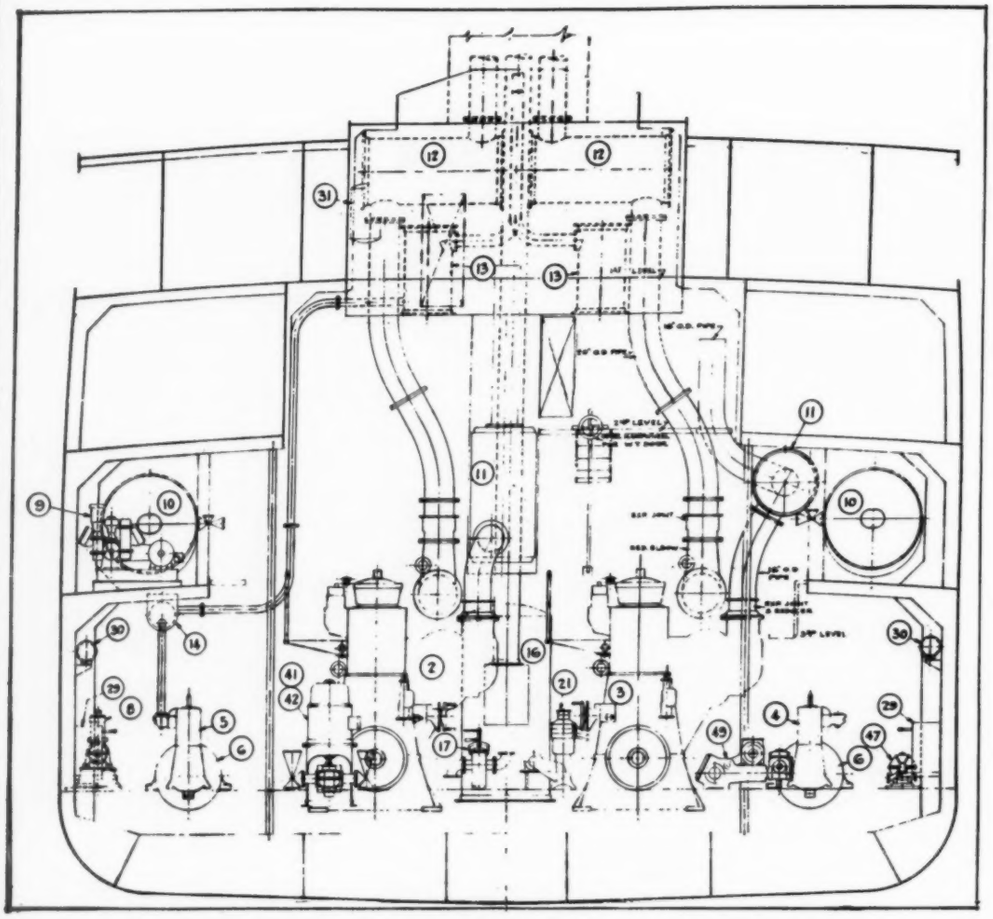
Plan view of the "Estrella's" engine room as it looks today after being completely redesigned. Note the availability of all equipment.

LIST OF PUMPS

ITEM	NO. REQ'D	SERVICE	MAKE	G.P.M.	TOTAL HEAD	SUCT.	DISCH.	H.P.	R.P.M.	REMARKS
40	1	DONKEY BOILER FEED						—	—	EXISTING. STEAM DRIVEN
41	1	LUB. OIL CIRC.	QUIMBY	500	70#	6"	6"	40	492/720	RIGHT HAND
42	1	LUB. OIL CIRC.	QUIMBY	500	70#	6"	6"	40	492/720	LEFT HAND
43	1	S.W. CIRC.	GARDNER-DENVER	700	50#	6"	5"	30	1150/1750	
44	1	S.W. CIRC.				6"	6"	16	925	EXISTING. RELOCATED
45	1	F.W. CIRC.	GARDNER-DENVER	700	50#	6"	5"	15	1750	
46	1	F.W. CIRC.				6"	6"	30	1150/1450	EXISTING. RELOCATED.
47	1	SANITARY	YEOMAN'S			2"	1½"	10	1750	
48	1	BALLAST	McGOWAN	450	50#	7"	6"	20	1200	6-10 HORIZ. DUPLEX
49	2	BILGE	McGOWAN	150	125#	4"	3"	5	1200	6-8 HORIZ. DUPLEX
50	1	F.O. TRANSFER								EXISTING. RELOCATED
51	1	F.O. TRANSFER								EXISTING.
52	2	F.O. BOOSTER	ROPER	15	50#	1½"	1½"	1½	1750	
53	1	S.W. CIRC. FOR REFRIG. MACH'Y & COMPRESSORS	DEMING	20	25#			1½	1750	
54	1	F.W. SYSTEM	DEMING					½		42 GALLON TANK

LIST OF EQUIPMENT

ITEM	NO REQ'D	DESCRIPTION	REMARKS
1	2	SHAFT	10⅛" DIA. LENGTH FROM MFRS. BY SHIPYARD
2	1	MAIN ENGINE, STBD. MODEL E-6215A	HARRISON DIESEL 6 CYL. 2 CYCLE 25" BORE 27½" STROKE 1400 BHP AT 440 RPM
3	1	MAIN ENGINE, PORT	DITTO
4	2	AUXILIARY ENGINES	WINTON DIESEL 6 CYL. 4 CYCLE 9½" BORE 11" STROKE 175 HP AT 630 RPM
5	1	AUXILIARY ENGINE	DITTO
6	8	GENERATORS	SIEMANS-SCHUCKERT 130 KW 450 RPM
7	1	EMERGENCY GENERATOR	HOT BULB 15 KW EXISTING.
8	1	EMERGENCY COMPRESSOR	EXISTING. 6.5 HP 1260 RPM
9	2	AUXILIARY AIR COMPRESSORS	
10	2	STARTING AIR TANKS	EXISTING AFT AIR TANKS, PORT & STBD.
11	2	MAIN INTAKE SILENCERS	MAXIM.
12	2	MAIN EXHAUST MUFFLERS	EXISTING. CONNECTION FOR 20" EXH. PIPE
13	2	AUXILIARY EXHAUST MUFFLER	EXISTING.
14	1	AUXILIARY EXHAUST MUFFLER	WITH ITEM NO. 8
15	1	MAIN SWITCHBOARD	BY SHIPYARD
16	1	DONKEY BOILER	EXISTING
17	1	LUB. OIL STRAINER	ARDALE DUPLEX SIZE 6"
18	1	F.O. STRAINER	PUROLATOR D-111
19	1	LUB. OIL COOLER	COMBUSTION SERVICE & ENGINEERING
20	1	F.W. COOLER	DITTO
21	1	LUB. OIL PURIFIER	DE LAVAL NO. 700 EXISTING
22	1	F.O. PURIFIER	EXISTING
23	2	LUB. OIL STORAGE TANKS	EXISTING. 400 GAL. CAP. EACH
24	1	LUB. OIL STORAGE TANK	EXISTING. RELOCATED. 550 GAL. CAP.
25	1	LUB. OIL STORAGE TANK	EXISTING. RELOCATED. 175 GAL. CAP.
26	1	F.O. DAILY SERVICE TANK (RAW OIL)	BY SHIPYARD. 850 GALS. CAP.
27	2	F.O. DAILY SERVICE TANK	BY SHIPYARD. 1400 GALS. CAP. EACH
28	1	CATCH-ALL TANK	EXISTING. RELOCATED GALS. CAP.
29	3	LUB. OIL FILTERS	FOR ITEMS 4 & 5
30	3	LUB. OIL COOLERS	FOR ITEMS 4 & 5
31	1	SURGE TANK	ABT. 50 GALS. BY SHIPYARD
32	1	F.W. TANK	ABT. 42 GALS.



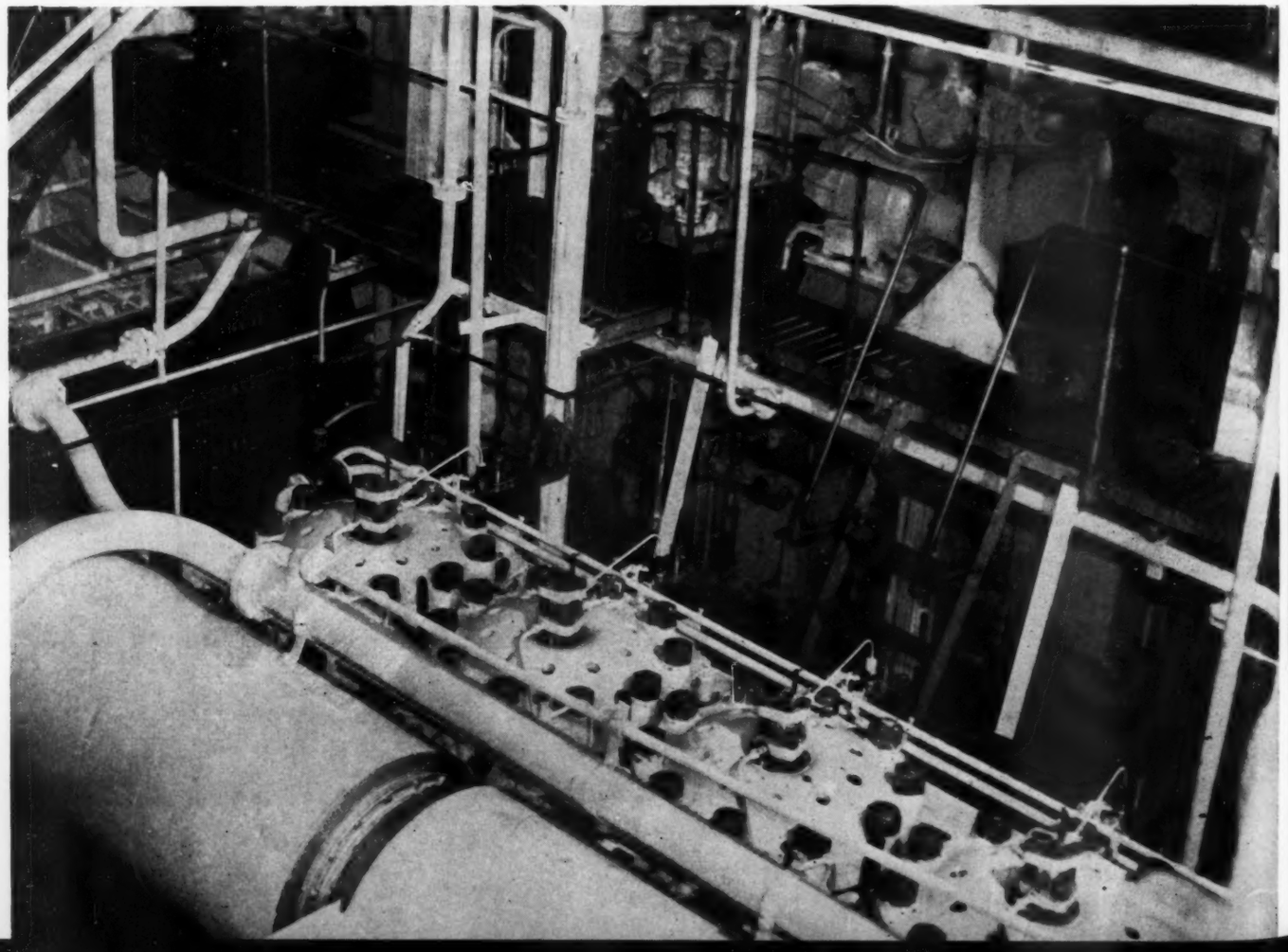
The main engines and the exhaust system dominate this sectional view of the engine room.

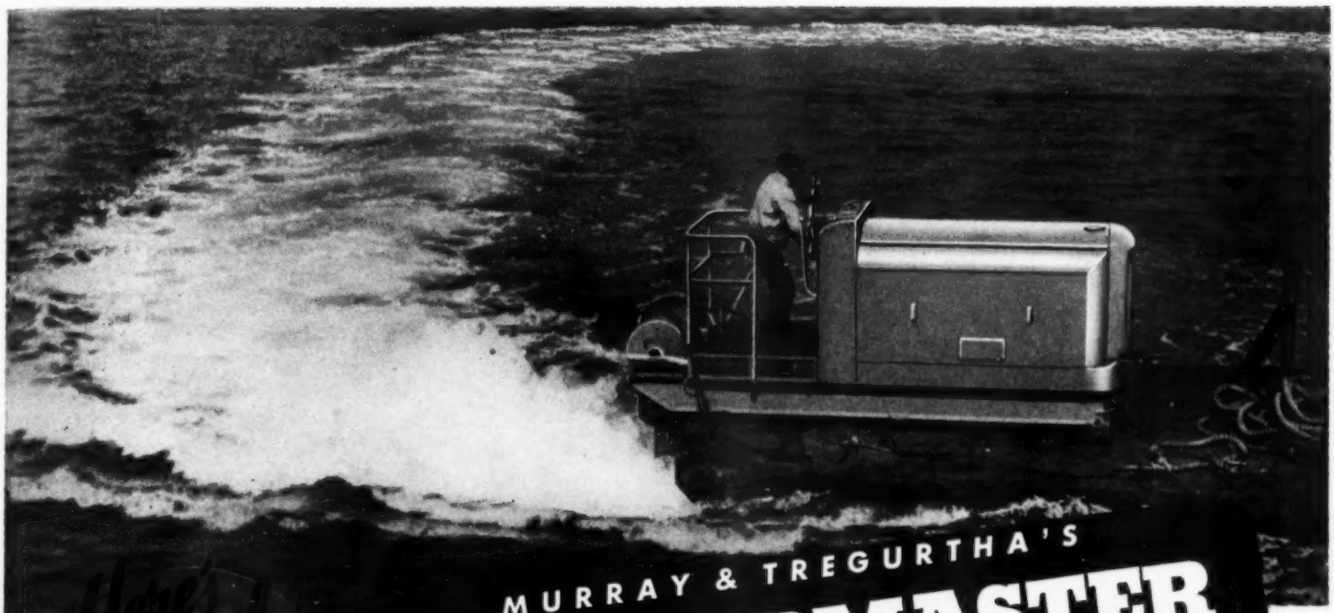
was overhauled and her holds reconditioned, and her tanks tested. W. D. Crane, manager of the Bethlehem Yard, said the vessel was in first class condition for resumption of her peacetime operations. She will operate as a cargo carrier between the United States and Mediterranean ports. Immediately after her trial trip the *Estrella* began loading for her first trip to North Africa with a cargo of farm machinery and other essentials for the reconstruction of devastated economies abroad.

Norway can be proud of this ship which served the allies so well during the war and which now joins the swiftly increasing number of Norwegian ships which are helping Norway recover her prewar maritime status.

Left to right: W. D. Crane, Bethlehem official; F. Odfjell, owner; and E. Tonseth, Captain.

Picture of "Estrella's" engine room shows forward end of one of the 6-cylinder, 1400 shp. Hamilton Diesels. The equipment seen at top of picture is the Ingersoll-Rand auxiliary air compressor.





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FEED MILL BOOSTS PRODUCTION 100% WITH DIESEL

By DWIGHT ROBISON

MR. SHARRER, owner of the Hampton Feed Mill of Hampton, Pennsylvania, is a recent convert to Diesel operation. The reason for his conversion is the installation in his mill of a new Diesel. The former gasoline engine installation had a higher horsepower rating than the new Diesel but did not have anywhere near the capacity that the Diesel has when driving the feed concern's 12 in. Dellinger Hammer mill. The new Sheppard Diesel can handle 100 bushels of corn per hour using a 1½ in. screen. When driven by the gas engine the mill was capable of only 45 bushels per hour. The same figures are proportionately true for the milling of wheat, oats, and barley: 25 bushels per hour for the Diesel, 12 for the gasoline engine.

To top these figures the owner says that the Diesel averages 4¼ gallons of fuel per day as against the 27½ gallon consumption by the gasoline engine. After a review of the facts there is little wonder why Mr. Sharrer approves of his Sheppard Diesel for efficient feed production at his Hampton mill.

Sheppard Model 6D Diesel at feed mill.

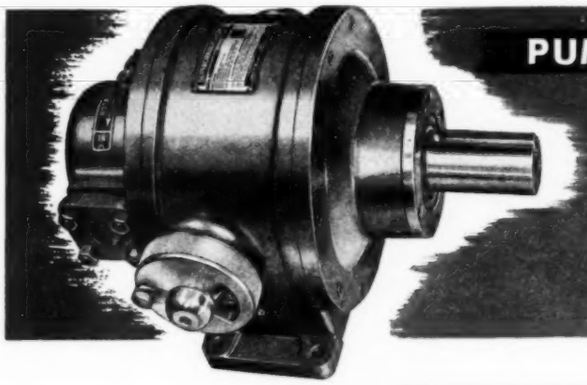
Exterior view of mill.

Diesel and hammer mill arrangement.

Every One a Star!

Superdraulic pumps, motors, transmissions, relief valves, check valves, 4-way valves, power units, and high-pressure couplings enable you to utilize hydraulics at its best. Following are descriptions of principal Superdraulic units:

Superdraulic

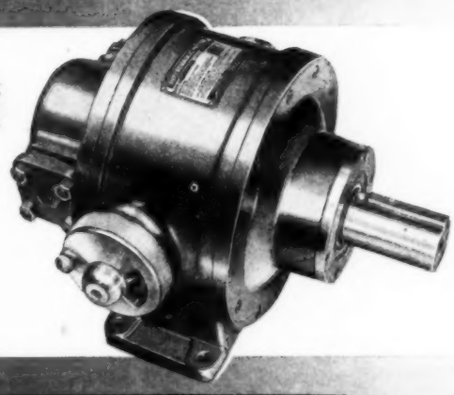


PUMPS

High-pressure hydraulic pumps—5000 psi, 40 hp with 0 to 12 gpm at 1200 rpm or 0 to 17 gpm at 3500 psi. Here is giant power in a midget hydraulic pump only 10½" in diameter. Instantly responsive finger volume control gives variable volume and reversible flow. Also available in constant delivery types only 9" in diameter with identical rating. Ideal power for presses, plastics machinery—wherever hydraulic power is required and where space is at a premium.

MOTORS

Triport hydraulic motors—26½ gpm at 3500 psi input at 1200 rpm, 19 gpm at 5000 psi input at 1200 rpm. Giant horsepower and giant torque in hydraulic motors of midget size. Sixty-six power strokes per revolution provide high starting torque and turbine-smooth output. Up to 47 hp with torque range up to 200 lbs. ft. in either type. Ideal for driving all types of machinery.



TRANSMISSIONS

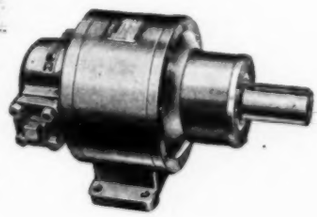
Infinite-speed hydraulic transmissions. Combining the famous Superdraulic variable delivery pump and triport motor, these units provide infinitely variable, turbine-smooth power in minimum space. Up to 200 lbs. ft. output torque, 0 to 1200 rpm (reversible), up to 30 hp output. A perfect transmission for countless industrial applications.

It is almost certain that in their long experience, Superdraulic engineers have been called upon to solve hydraulics problems similar to yours. They would welcome an opportunity to sit down with you and discuss the application of hydraulic power to your products.

In the meantime, send for complete technical descriptions of the above Superdraulic units.

JUNIOR PUMPS

The Superdraulic Junior Pump, as its name implies, is practically a duplicate of the 40 hp Superdraulic constant delivery pump on a reduced scale. A single bank of eleven plungers delivers 3 gpm at 1800 rpm and 2 gpm at 1200 rpm. This pump is furnished for 5000 psi continuous duty operation.



Superdraulic Corporation

HYDRAULIC PUMPS • MOTORS • TRANSMISSIONS • VALVES

MILLER AT FORD ROAD • DEARBORN, MICHIGAN

POSTWAR HIGHWAY MAINTENANCE

GRANTING that the post-war trend is to new cars, and more of them, with no gas rationing to hamper operation, highway departments throughout the land have planned an unprecedented rush of highway construction, fashioned for traffic volume and higher speed with safety innovations to be included in each new highway.

Scarcity of materials has inspired immediate improvements on highways to breach the time gap between planning and construction of the "super highways." Such operations have provoked several machinery transformations in the field. The Kaw Paving Co. introduced something novel in the way of operational equipment and put the renovated items to work in widening and stabilizing the road shoulder on Highway No. 40-24 between Silver Lake and St. Mary's, Kansas.

The company was contracted to add a two-foot asphalt strip to each side of the present concrete highway. It utilized Diesel-powered motor grader to prepare the widening and a Diesel track-type tractor to carry its novel "side ditch spreader box used in the spreading operation."

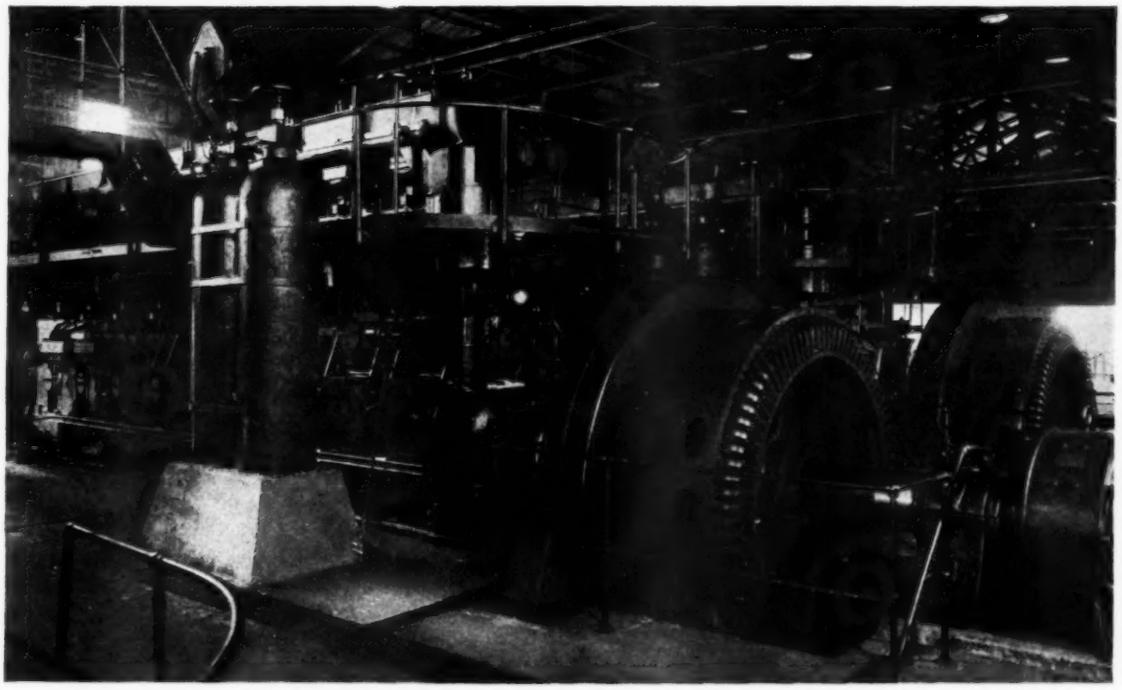
Diesel tractor spreading asphalt concrete to widen the present concrete highway connecting Silver Lake and St. Marys, Kansas.

Diesel grader removing gravel and dirt from shoulder in preparation to widening Kansas highway.

After scarifying the gravel shoulder, the motor grader, with an extra piece of steel welded to the right side of the blade, cut away gravel and dirt to a depth of eight inches and a width of 30 inches. The attachment provided a clean cut, flush with the concrete. Then the strip was rolled and a 1½ inch layer of chat spread the full width of the strip by a truck-powered apparatus and a stream of liquid heated asphalt played along the edge of the pavement.

In spreading the asphaltic concrete mixture, the company used its novel "spreader box." The mixture is dumped from trucks into the box from where it is shoveled to a hopper that keeps it pliant as it is dropped into the ditch. The box sides control the spread and make the initial levelling preparatory to final rolling. The mix is put on in two layers, the lower one 30 inches wide and the upper one 27 inches wide, and each layer is rolled.

Peace of Mind...
FOR DIESEL ENGINEERS



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OPERATING and maintenance headaches make life tough for engineers... make operators wish they had a friend. That's where GASCON OIL comes in. It *makes life easier* for the Diesel engineer.

Inherent qualities in the basic crude give Gascon *natural ability* to clean engines and keep them clean . . . to wash away and disperse carbon and crankcase accumulations.

The effect of these qualities on Diesel operation gives engines longer time between tear-down . . . more continuous operation time . . . lower maintenance cost . . . more efficient operation.

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UNIQUE CONTROLS FEATURED IN NEW

By WILL H. FULLERTON

ONE of the outstanding installations aboard the recently converted *E. J. Block,* Great Lakes ore carrier, is the steering gear. The gear is the wartime development of the William Sellers Company for the United States Maritime Commission on its C1-M-AV1 vessels and which now is available for commerical installations. Briefly, the gear is a two ram, four cylinder, electro-hydraulic mechanism with a full follow-up control system. Remote or pilot house control is accomplished by means of a hydraulic telemotor transmission system. This control system is simple yet extremely effective and incorporates several unique features which make for efficient and safe navigation. Essentially a telemotor is a power transmitter. For remote control one telemotor, incorporated in the helm installation, is located on the bridge of the ship. The other is located in the steering engine room. The two are connected by hydraulic transmission piping. As the helm is spun by the steersman, oil in the hydraulic cylinders is forced through the transmission lines to the telemotor located in the steering compartment. This telemotor then activates the actual steering gear through a rack and gear mechanism which rotates an eccentric cam through planetary differential gearing thus controlling the output of the hydraulic pumps which actually operate the steering rams. The follow-up mechanism is incorporated in this system in such a way as to stop the pump output when the rudder reaches the desired angle. The follow-up response closely follows the helm movement with negligible lag. The stopping of the control input movement is closely followed by the stoppage of the steering gear through follow-up action.

In the event that the rudder takes over in a heavy seaway during rough weather under conditions where heavy pressure is exerted on the rudder itself and the back pressures build up in the hydraulic cylinders, the relief valves will blow, transferring oil from one side of the system to the other. If this condition should occur, the responsive movement into the follow-up side of the control box would cause the hydraulic pumps to be stroked in a direction to return the rudder to the position established by the helm as soon as the rudder load becomes less than the pressure setting of the relief valves. This action is entirely automatic.

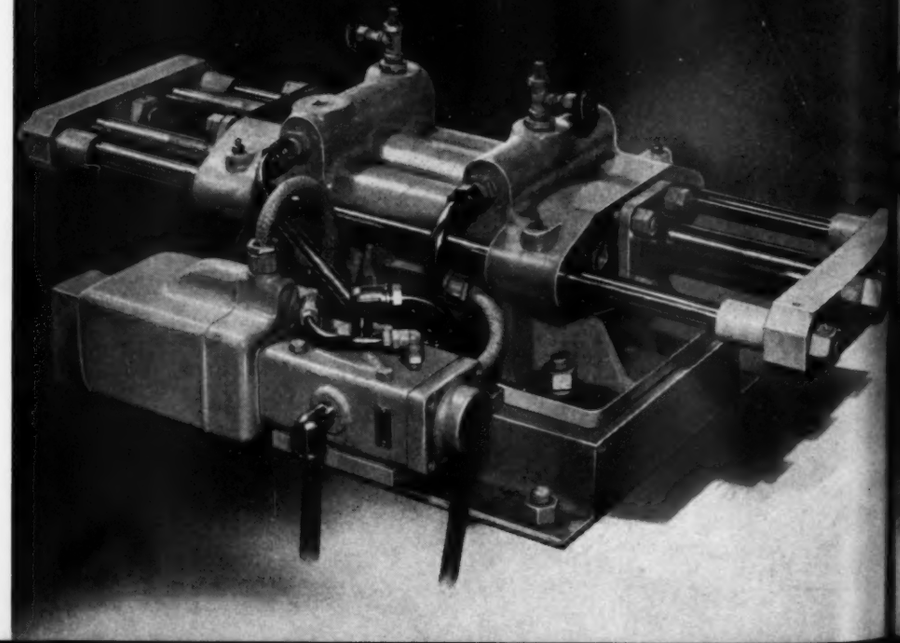
Another excellent feature of this steering system is the two independent power sources—two pumps driven by separate motors. The power changeover is easily made. The Sellers hydraulic telemotor contains the secret of the other refinements of the gear. The elimination of the commonly used centering valve system results in the possibility of maintaining a tight hydraulic system which means a responsive helm and no lost movement. No centering springs are used and thus the effort expended by the helmsman is only that needed to activate the power equipment. In place of centering springs the centering or synchronizing of the forward and after telemotor is automatic at neutral rudder position, and then only when the two telemotors are out of synchronization. This is automatically accomplished by an electrical control system and does not destroy the tightness of the system, nor allow loss of steering control. Another allowance is made to permit the fore and aft telemotor to be synchronized when the rudder is held at an angle through necessity, as in cases of fueling at sea, when a constant rudder angle is required. The equipment is easily adaptable to Gyro-steering. One end of the control rack is designed for such use and the installation is easily made.

During the trials of the *E. J. Block,* Sellers engineers put the steering equipment through some tough maneuvers. The equipment was designed to swing the rudder from hardover right to hardover left in 30 seconds. However, by increasing the pump stroke of the hydraulic pumps this time was cut to 20½ seconds. Maximum rudder torque is 2,943,000 lb. in.

In the event of power failure the equipment may be operated by a hand pump which is capable of controlling the rudder in emergencies. The rudder can be swung 30° from 15° port to 15° starboard in 60 seconds by four men operating the hand wheel pump with the ship moving at half speed. Also the rudder can be secured or braked by shutting off the cylinder valves thus obtaining a hydraulic lock on the rams.

In the event of a pilot house casualty the steering gear can be controlled from below or from an aft deck steering station by means of trick wheels. This method of steering is accomplished by either one of two trick wheels located above each of the two independent control boxes. These trick wheels, disconnected when the telemotor is in operation by means of a clutch to prevent the overhauling of the mechanical parts, are easily connected for use. The aft

View of the Sellers telemotor receiver which is di rect-connected to the control rack of steering gear.



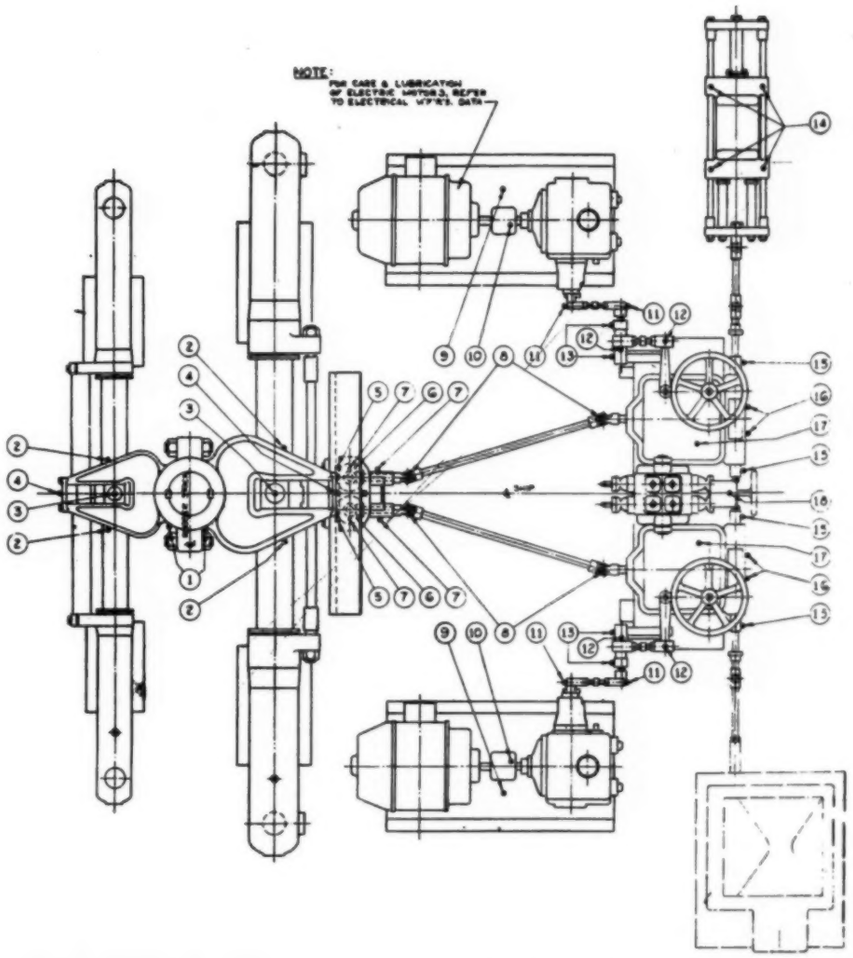
NEW HYDRAULIC STEERING GEAR

deck steering column is the extension of the trick wheel previously described.

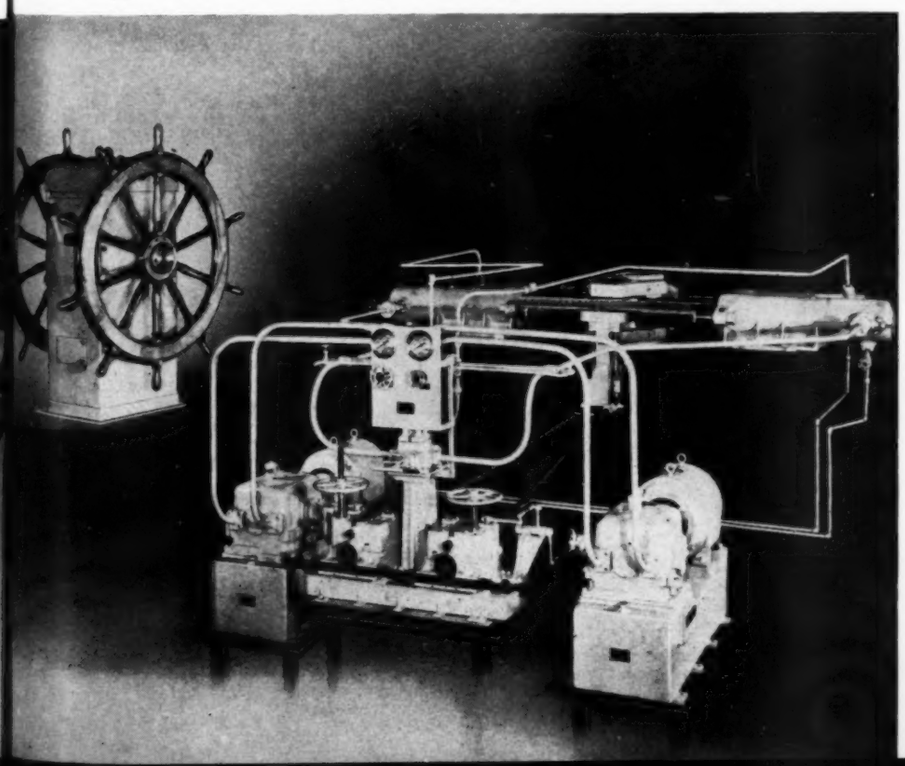
Both the below decks and aft deck stations as well as the bridge are equipped with mechanical rudder angle indicators. The equipment is fitted with mechanical limit stops both on the control equipment and upon the main ram guide to prevent overtravel of the rudder.

The main hydraulic pumps which supply the rams were supplied by the Oil Gear Company of Milwaukee and are specially designed for steering gear duty. These two pumps are of a two way variable delivery type, with hydraulic servo-motor controls. They are capable of operating the steering gear at the required rudder rate at a stroke setting not in excess of 70% of full pump stroke.

Two oil replenishment and mounting tanks are provided which are capable of holding the oil in the entire system. The main pumps are controlled by a hydraulic servo-motor means, the power source for which is obtained from a gear pump integral with the main hydraulic pump. This auxiliary also furnishes the source of power for pressure replenishing of the main hydraulic system assuring freedom from cavitation and resultant noise.



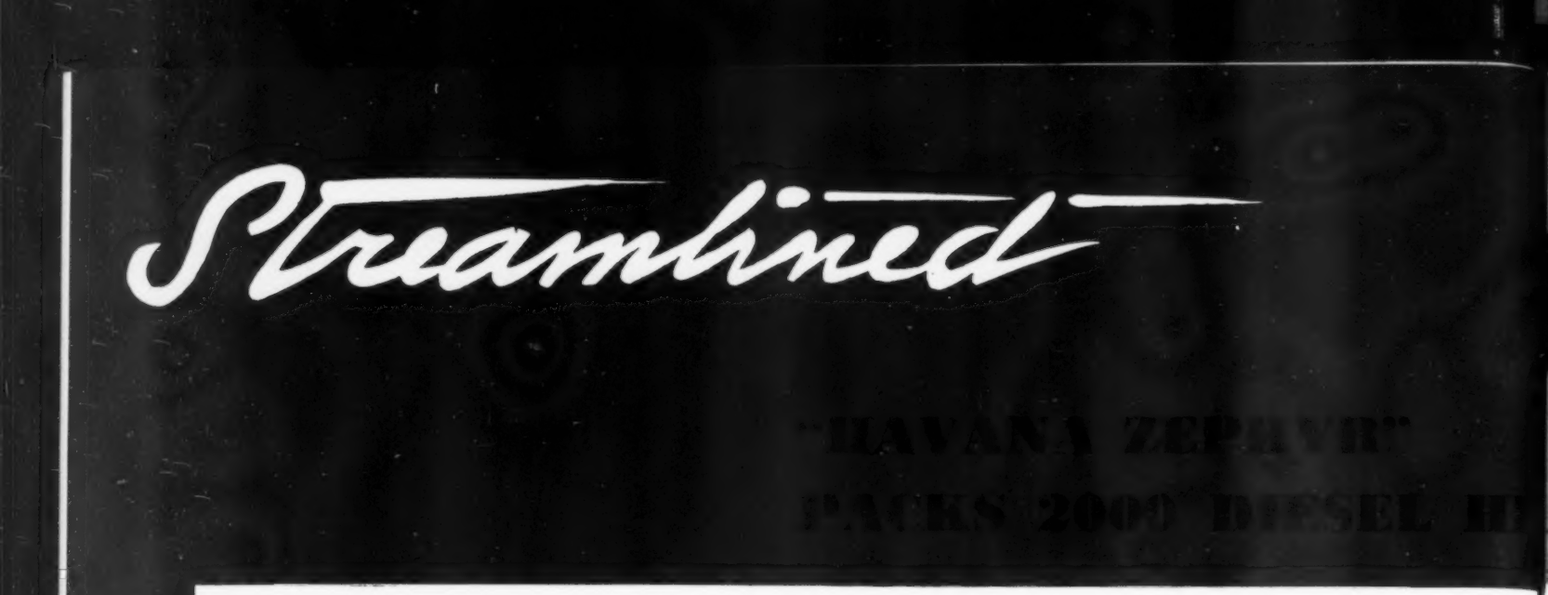
Drawing above shows mechanical arrangement of the unit. See table below for identity of parts.



View of steering gear showing two control boxes flanked by the two hydraulic pumps. Insert at upper left shows the emergency hand steering column located on aft deck.

1 *Rudder stock thrust bearing*
2 *Crosshead guide*
3 *Crosshead pin*
4 *Stop bracket*
5 *Rack and pinions (teeth)*
6 *Bevel gears (teeth)*
7 *Gear stand bearing*
8 *Universal joint*
9 *Oil tank (hydraulic system)*
10 *Pump flexible coupling*
11 *Pump control link*
12 *Differential control link*
13 *Pump control rocker shaft*
14 *Telemotor ram guide*
15 *Rack teeth*
16 *Rack guide*
17 *Differential gear case*
18 *6-way transfer valve latch*

Streamlined



By DOUGLAS SHEARING

WHEN folks who know river boats and their builders see the new twin screw towboat *Havana Zephyr,* they will say "there goes another St. Louis Shipbuilding boat." For this towboat, like all other boats built by this company, has a distinctive and modern appearance, similar to the *Sohioan* and the *Henry S. Sturgis,* in that it is streamlined. On the *Havana Zephyr* an unusual feature is that the forward part of the deckhouse forms a half-spherical shape and tapers back in long easy curves to form one of the most graceful boats on the river. An unusual touch was added to the streamlined effect by curving and raking the aft mast, and instead of the conventional type of derrick on the aft end of the deck a horizontal type boom is provided which is very satisfactory and blends into the general appearance of the boat better than a derrick.

With a hull 126 ft x 29 ft. x 9 ft. and a normal draft of 6 ft. 6 in., the *Havana Zephyr* will carry 164 tons of fuel sufficient for about 3 weeks continual running. The hull has the model-scow bow and a special stern with the St. Louis Shipbuilding Skeg as used on a number of their previous boats. Both in tank tests and in actual operation the use of these skegs have increased the push of the boats by 5 to 7 per cent. Just recently an extensive series of tests were made with a tow of loaded barges and a dynamometer barge under varying river conditions, and these results corroborated all previous tests and indicated about 6 per cent more push with the skeg than without. The engines are located near the stern of the boat to eliminate vibration and engine noise in the quarters. The engine room ceiling is "sound-proofed," and the walls are insulated and lined with an asbestos cement board.

The deckhouse is of steel lined with plywood and insulated with 2 in. of Fibreglas. The window frames, except those in the pilot house, are of aluminum, and all exterior doors are of steel.

Quarters are provided for a crew of 18 and 2 guests. There are 4 bathrooms on the boat, one on the main deck for the crew, and a private bathroom for the cooks. On the upper deck the pilots and chief engineer have a connecting bath, as also do the Captain's and guests' staterooms.

There is a lounge for the crew on the main deck, and a lounge for the officers on the upper deck. The officers' lounge is worthy of note as it extends the full width of the deckhouse and is semi-circular. The walls are mahogany, and between the windows is a set of 6 Sepia-toned photographs about 3 ft. wide by 4 ft. high. This together with a tasteful selection of furniture makes the lounge very pleasant and comfortable.

As part of the functional design of the deckhouse, the streamlining of the main deckhouse on the aft deck is carried to within 6 feet of the stern of the boat, and in addition to the appearance feature, this streamlining serves to cover the steering gear, and with a door leading from this space to the engine room the gear is kept clean and dry and easily available.

The *Havana Zephyr* has a pair of 84 in. 3-blade propellers manufactured by the St. Louis Shipbuilding & Steel Co. and are of their standard wide blade design. The 9¼ in. propeller shafts are by Elwood Forge Co.

In all mechanical features as well as in appearance, the *Havana Zephyr* is the most modern of towboats. Powered with two Superior 6 cylinder 14½ in. bore by 20 in. stroke, turbocharged Diesel engines, each engine developing 990 hp. at 360 rpm., this boat will be one of the most powerful Diesel towboats on the river. The main engines are equipped with Elliott-Buchi turbochargers, Maxim exhaust silencers, Air Maze intake silencers, Ross lube oil coolers, Kingsbury thrust bearings, Weston tachometers, and a Gardner-Denver 40 cfm. water cooled air compressor is attached to each engine.

The fuel oil and the lube oil for the main engines and auxiliaries are cleaned by 3 Hilco oil purifiers, one for the fuel oil and one for the lube oil system of each engine.

The cooling water system for the main engines water is circulated through a section of the bilge knuckle. This system is the same as used is of the built-in type where the engine cooling on previous boats built by St. Louis Shipbuilding, such as the *Sohioan, Sturgis, Celeste, Glenn Traer, etc.* For the convenience and comfort of the engineer, the controls for the main engine have been extended so the engines can be handled from the main deck level.

For starting air, in addition to the two Gardner-Denver type compressors attached to the engines, there is also a Gardner-Denver type air compressor driven by a 30 hp. Fairbanks-Morse Diesel engine.

The electric power for the *Havana Zephyr* is supplied by two 10 kw. Fairbanks-Morse tail shaft generators driven by the main engines and a 15 kw. Fairbanks-Morse Diesel driven auxiliary generating set. The tailshaft generators are controlled by two safety car heating voltage regulators. A 56 cell—112 v. Philco battery floats on the line and all electric distribution is through a switchboard furnished by Wurdack Electric Mfg. Co. The boat has two 19 in. arc searchlights and two 500 watt floodlights. The running lights and towing

The latest in towboat design is the 126 foot "Havana Zephyr" built by the St. Louis Shipbuilding Company. Twin Superior Diesels make her one of the most powerful towboats on the Mississippi.

lights are by Perkins and the running light switch panel is by Bendix Marine.

The galley is well equipped and is furnished with an electric range, a refrigerator 72 in. wide, 30 in. deep, and 80 in. high, a large front-opening deep freeze box and a 60 in. sink. To meet the requirements of the U. S. Public Health Service, an electric hot water heater and a sylphon valve is installed in the drinking water system to insure a supply of 170° drinking water at the sink for washing dishes. An electric water cooler is installed.

The steering system is of the St. Louis Shipbuilding electro-hydraulic type with electric follow-up controls. The very neat control stand in the pilot house contains the steering levers, with separate levers for the steering rudders and backing rudders, the engine telegraph transmitter, tachometers, air gauge and light switches for the various lights necessary to control from the pilot house. The *Havana Zephyr* has three steering rudders and four backing or flanking rudders being separately controlled.

The heating system for the boat is of the hot water, forced circulator type with cast iron radiators. The heating boiler is a Crane Co. No. W020 and all controls, etc., were furnished by the Crane Co.

The bilge pump is a self-priming centrifugal pump. The fire pump is a Fairbanks-Morse capable of deliver 150 gpm. at 110 psi.

The builder has equipped the *Havana Zephyr* with their automatic trimming device to keep the boat trimmed as the fuel is used without the necessity of the engineer watching the trim of the boat and operating his ballast pumps.

A loud speaker system to enable the pilot to instruct crew members on the forward deck of the boat or the front end of the tow has been installed.

With the addition of the *Havana Zephyr* the owners, Streett Towing Company of St. Louis, now own and operate the towboats *Mokita, Zephyr,* and *Havana Zephyr* (a total of 4150 hp.), and a barge fleet consisting of a total capacity of 114,000 barrels.

Since its start in August, 1943, the Streett Towing Company, a partnership consisting of Harper C. Patton, Kenneth C. Baker, and Rolla W. Streett, has proven to be one of the most progressive and energetic towing companies on the river and in their short history have earned the respect and admiration of all the river men. Starting out with the M/V *Mokita* and the M/V *Papoose,* and six oil barges bought from Eddie Erlbacher, they have steadily increased their operation and fleet to its present size, and are busy towing petroleum products from the lower Mississippi to terminals on the Ohio, Cumberland, Upper Mississippi, and Illinois Rivers. The direct management of the Streett Towing Company is in charge of Harper C. Patton who has as his able assistants, Clarence Kinder as port engineer and a recent addition, John Hammes in charge of operations. Both of these men are well known and well liked by river men.

One of the main engines aboard the "Havana Zephyr." There are two of these 990 hp., 360 rpm. Superiors, equipped with Elliott-Buchi turbochargers.

G. M. & O. R. R. TO GET 45 ALCO-G. E. DIESEL LOCOMOTIVES

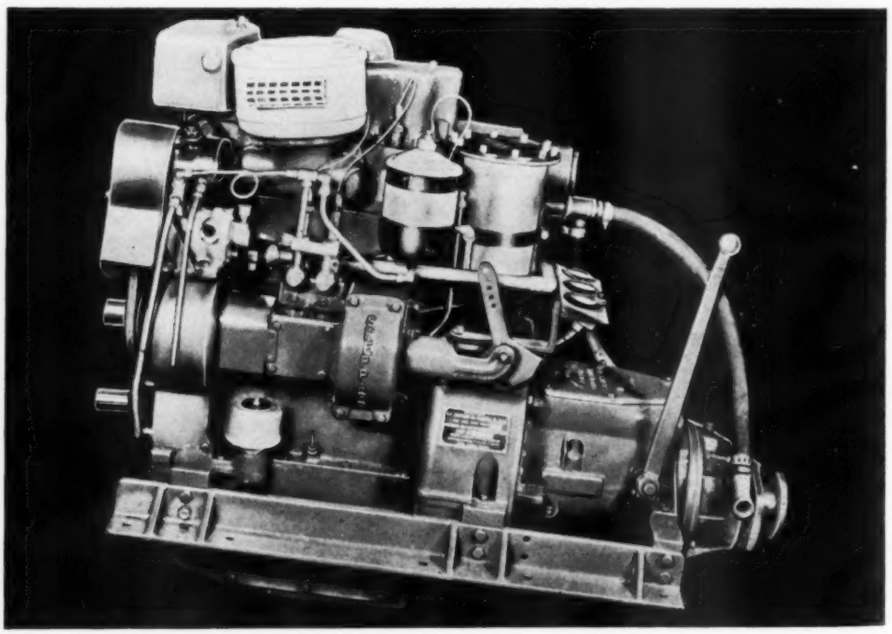
TWENTY-TWO units of an order for 45 Alco-GE new Diesel-electric road locomotives for the Gulf, Mobile and Ohio Railroad have been completed and delivered by the American Locomotive Company. The new locomotives are being placed in G, M & O's important freight service between Mobile and St. Louis as rapidly as they are delivered. The new 115 ton, 1500 horsepower units can be operated in multiples to deliver 1500, 3000 or 4500 horsepower, depending upon the power desired for a given run.

One of the new 1500 hp. Diesel locomotives built by the American Locomotive Company.

Many new features of design have been incorporated in the G, M & O locomotives to reduce maintenance costs, including easy accessibility of parts. By simple gear changes, without alteration of other equipment, the new Diesel-electrics can be geared to operate at speeds ranging from 65 to 120 miles an hour. Each unit of the new locomotive weighs 230,000 pounds fully loaded, is 51 feet, 6 inches long between coupling knuckles and has a wheel base of 36 feet, 6 inches. It stands 14 feet, 9 inches high. It is equipped with two four-wheel trucks and four electric motors geared to the driving axles. The weight per driving axle is 57,500 pounds. The wheels are 40 inches in diameter. It carries 1200 gallons of fuel oil and 200 gallons of lubricating oil. A new 600 horsepower Diesel-electric locomotive for mainline passenger service will be announced next month.

COMPACT MARINE DIESELS

THE R. H. Sheppard Company has developed a new 2 cylinder marine Diesel which can be hand started as well as by the standard 24 volt electric system. Designated as Model 13, this series is being manufactured in two sizes: 18 and 20 hp. They are 2-cylinder, 4-cycle with a rated speed of 1400 rpm. Their respective bores are 4 in. and 4¼ in.



New Sheppard Diesel for marine use. It is built in two sizes, 18 and 20 hp. It is supplied complete with hand starting optional.

They are said to be the largest marine Diesel yet available which are practical to start by hand. Ease of cranking is achieved by a special compression release. The Diesels are equipped with cadmium silver lined steel main and connecting rod bearings, along with precision ground journals on the crank shafts.

Measuring 44 inches overall, 37¾ inches high and 23½ inches wide, they are two of the smallest Diesels of their horsepower rating available. Their weight, fully equipped, is 1500 pounds. They are furnished with a built-in heat exchanger and expansion tank and a water-cooled manifold which makes them ready to operate as soon as the sea water and fuel lines are connected up and the propeller shaft is bolted on.

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PORTABLE POWER PLANTS FOR REHABILITATION OF WAR-TORN AREAS

By E. E. LACY*

AMERICAN manufacturers continue to furnish mobile Diesel-generating plants for emergency power in devastated areas. The unit described here is typical of many such equipments being shipped abroad. This portable power plant is completely self-contained, yet compact, quickly assembled at point of use, easy to operate, and capable of operating under any weather and climatic conditions.

Mobility is assured by the fact that the 50 ton power plant is composed of three skid-mounted sections; the Diesel engine section, the electrical section, and the radiator fan section. Each of these sections can be hauled on flat cars to the rail terminal and then on heavy duty trucks to the spot where the plant is to be set-up and put into operation. This mobility, plus the fact that the plant can be set-up in a few days time, will make it possible to bring electric power promptly to hospitals, communications, essential lighting and other vital municipal services in devastated areas until more permanent power generating facilities can be made available.

The dual rating of 1000 kva., 800 kw., 60 cycles at 600 rpm. or 833 kva., 667 kw., 50 cycles at 500 rpm. gives the plant the needed flexibility to serve in localities of two different frequencies. An automatic voltage regulator and an automatic governor control assure satisfactory electrical service at all times. The overall dimensions of the power plant, all set-up and ready to go, are about 36 feet long, 7½ feet wide and 14 feet high.

The Diesel engines used are HOR which were originally designed and manufactured for marine propulsion, and therefore, have of necessity been modified to meet the requirements of power generation service. The modification includes installation of a fresh water circulating system capable of handling 350 gpm., an air starting system, an exhaust muffler, and scavenging air filter and silencer. The lubricating oil and cooling water are circulated through separate radiators that are forced ventilated with a 70 inch fan driven by a 20 hp. motor. The lubricating oil strainer is mounted on the radiator supporting structure.

The fan motors are protected by bi-metal Deion breakers provided with a "hold-in" device that when depressed, prevents the breaker from tripping due to overload. This is to insure operation of the cooling system in case of emergency.

The engines are of the 2-cycle, double acting type, nine-cylinder, 9-1/16 in. bore and 13-3/8 in. stroke. For 60 cycle operation the governor is set up for 600 rpm. and for 50 cycles, for 500 rpm. A solid fuel injection system is employed with an individual pump for each end of each cylinder. Spring loaded differential area needle valves are used and are located in the cylinder head. The original use to which these Diesel engines were to be put required one-half rotate clockwise, the other half counter clockwise. As all of the engines are to be used on this project, the generators are designed to operate in either direction, thereby assuring complete interchangeability.

As mentioned before, the generators are designed for and built to operate in either clockwise or counter-clockwise direction. Special moisture resistance insulation makes possible operation of the generators over a wide temperature range (up to 120°F.) and in any climate. Radio interference suppression units eliminate the possibility of electrical equipment causing objectionable noise on communications equipment over the range of 0.5 to 145 megacycles.

Damper windings are provided and each generator is capable of operating in parallel with other similar units when more than one power plant is needed to handle the load and to operate within a load range of 20 to 110 per cent of full load.

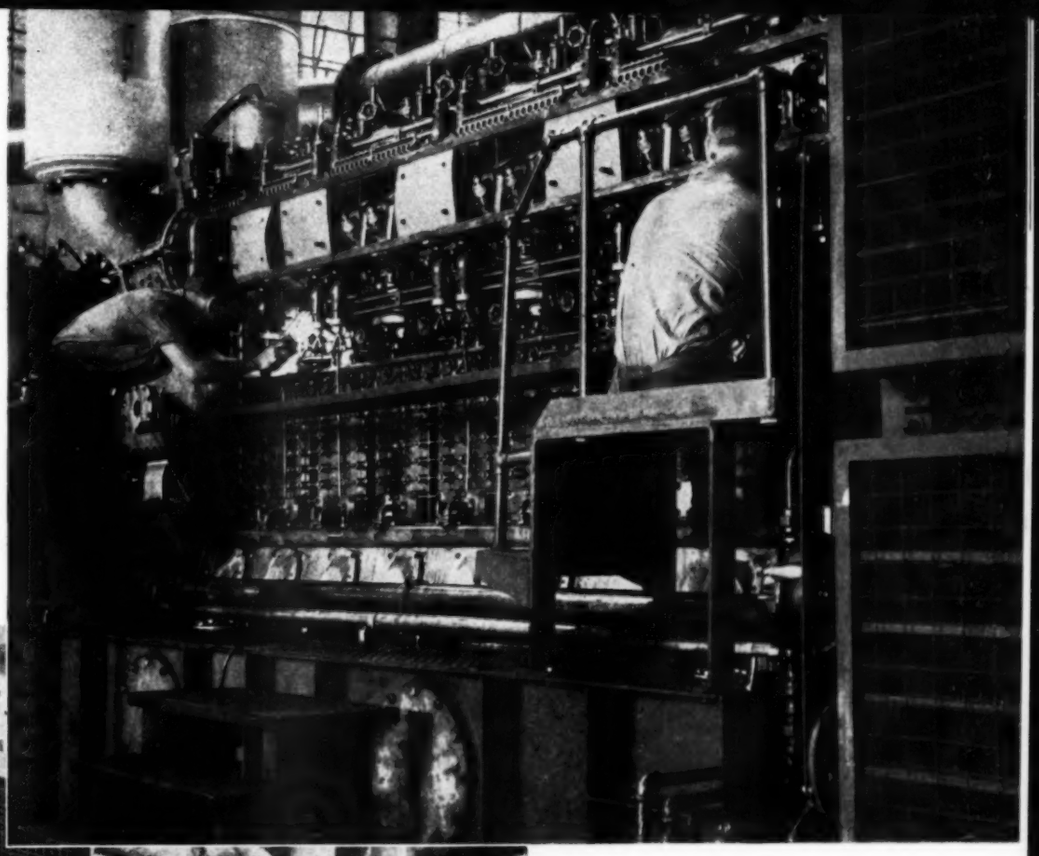
The 17/15 kw. dual rated, 125 volt, shunt wound, continuous duty, 50°C. rise exciter is designed to operate at 2000/1670 rpm. to make it as compact as possible. It is mounted atop the generator frame as a space saving measure. It is driven by V-belts and sheaves attached to the outboard end of the generator and exciter. All electrical control equipment is mounted on removable, sectionalized panel boards that are installed near the front of a 38 inch wide by 48 inch deep by 96 inch high water-proof and dust-proof cubicle. Ample provision for maintenance is assured by removable panels in the side and back giving ready access to the oil circuit breaker, disconnecting switch, instrument potential transformer, primary fuses and wiring. Anticipating the ruggedest duty possible, all relays, instruments and voltage regulators are designed and built for a high shock of 2000 foot pounds. The "station power bank" of three 15 kva. completely self protected distribution transformers is mounted adjacent to the control cubicle. The generated voltage of 2300 volts is here stepped-down for control purposes and fan motor power. A metal grill protects personnel from the 2300 volt primary terminals. Four bushings, each with a terminal lug for three #00 cables, are mounted on top of the cubicle. From here, the power generated is transmitted to the distribution bus or system.

A level foundation with a firm footing for the skid arrangement must be provided for the

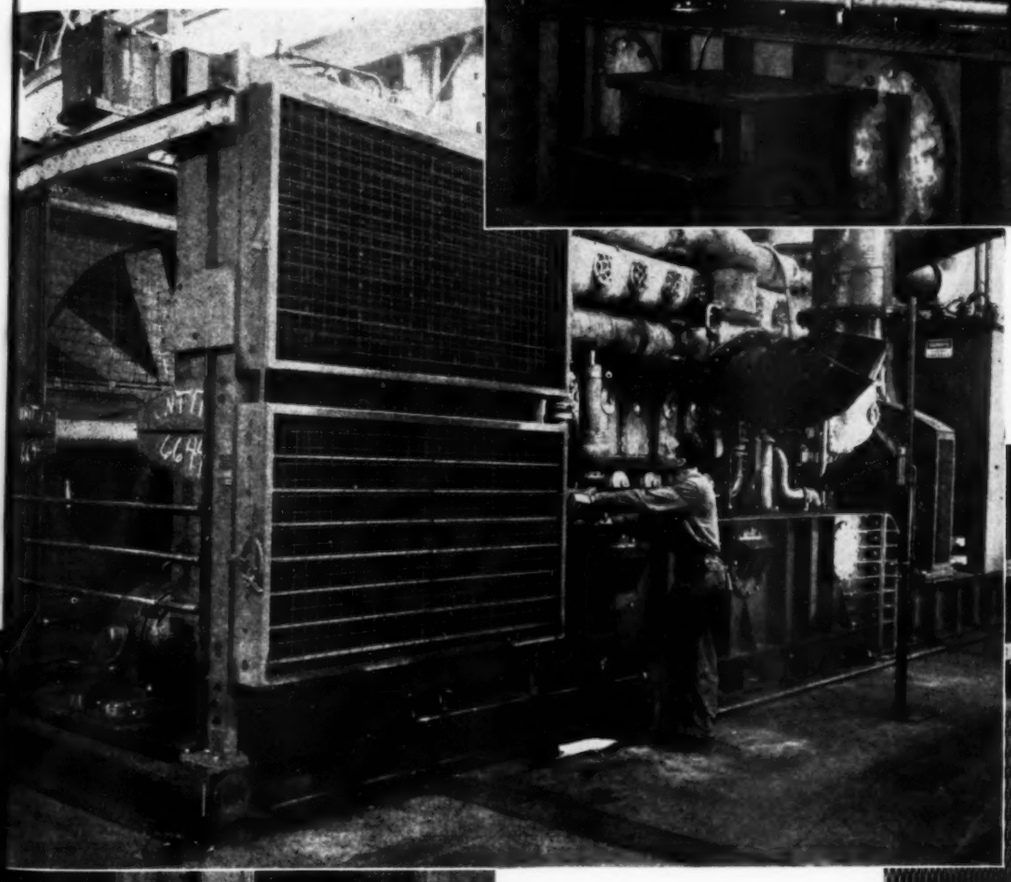
* *Machinery Electrification Section, Industrial Sales Department, Westinghouse Electric Corp., East Pittsburgh, Pa.*

power plant. The skid is primarily intended to provide a foundation for each section of the overall power plant during the handling and hauling necessary to transport it to the place where it will be used and not as the installation foundation without regard to terrain or footing.

The mobility inherent in this power plant means it can be moved from one place to another at a reasonable cost, thereby assuring its continued use in war torn areas as long as there remains a need for temporary power generator facilities. It can then be used for stand-by service.



Close-up of 9 cylinder, 2 cycle HOR Diesel undergoing final check-up prior to testing.

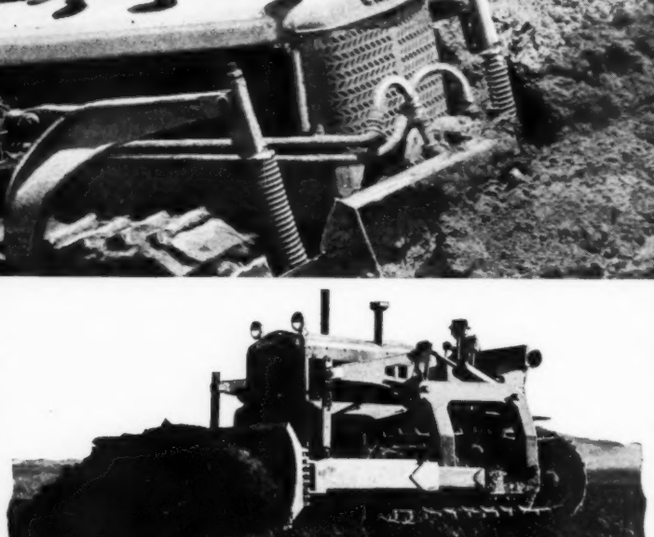


View of assembled power plant showing one of the two 70-inch cooling fans and its 20 hp. driving motor.

Power plant during assembly seen from radiator end. Diesel engine section is in the center, the electrical section is at the extreme left.

Cranking the air compressor engine preparatory to starting the Diesel engine.

Power PROTECTED BY Purolator



THESE rugged Cletracs are powered by Hercules Diesels, which are protected from the damaging effect of abrasives by Purolator Diesel Oil Filters. There are specially designed Purolator Diesel Oil Filters for filtering both fuel and lubricating oils, for every type of Diesel engine in use today. In fact, there are more Purolator Diesel Oil Filters in use than all other makes of Diesel Filters combined. PUROLATOR PRODUCTS INC., NEWARK 2, N. J. In Canada: PUROLATOR PRODUCTS (Canada) Ltd., Windsor, Ontario.

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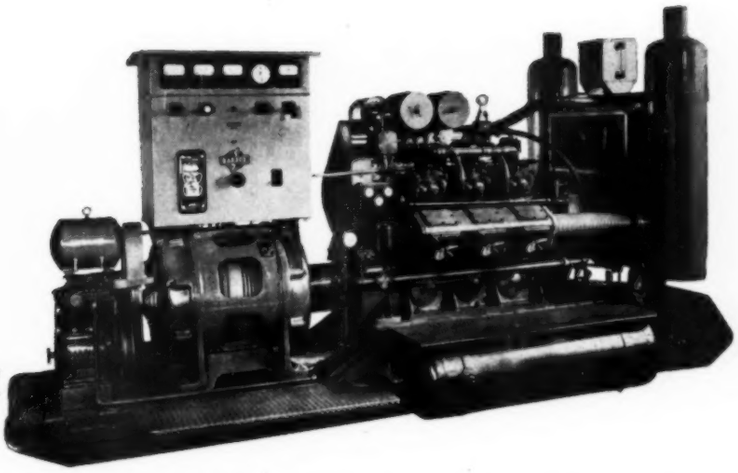
THE OIL FILTER

DIESEL GENERATING SETS FOR EXPORT MARKET



This 125 kva. Diesel Generator is completely self-contained.

DELIVERY of sixty-five 125 kva. Diesel generating plants designed especially for operation in foreign countries is now being made by Bardco Manufacturing & Sales Co., Los Angeles. One of the plants in this order is a complete, self-contained unit that includes the switchboard, cooling system, fuel tank, mufflers, air-starting compressor and storage tanks. The others employ the same components, but are to be set on concrete foundations to support the radiator, engine, and switch gear.

The self-contained unit employs a welded steel base that supports the plant and all auxiliary equipment. The equipment consists of a Young radiator, used for cooling, and an expansion tank with water-level sight gauge mounted at the highest point. On both sides of the radiator are exhaust silencers mounted vertically. Each silencer is connected by flexible metallic hose to the exhaust manifolds of the engine.

The Venn-Severin, 8-cylinder, Vee type, 2 cycle Diesel is rated 150 hp. at 750 rpm. Bore and stroke are respectively 7 in. and 8 in.

Governing of the Diesels is through a Pickering unit interlocked with the Bosch fuel injection pump. Fuel is filtered through a Cuno metal disc primary unit and a Bosch secondary filter. A 103 gallon fuel tank is built in to the base.

Scavenging air is drawn through four large Air Maze combination filters and silencers, by a Superchargers, Inc. scavenging blower.

The thirteen gallons of lubricating oil are circulated through a Briggs Clarifier and two Ross heat exchangers. Normal operating pressure is 35-40 pounds at a maximum temperature of 175°F. A Detroit Lubricator alarm switch is provided on the lubrication system to guard against low pressure or high temperature.

Between the engine and the Bardco alternator is a Thomas flexible coupling. The 125 kva., 6 pole, 400/230 volt, Bardco alternator is rated at 50°C. continuous, and is of the 50 cycle type. Excitation is by a belted, shunt wound, 3 kw. generator mounted above the alternator. It operates at 1750 rpm. and is rated at 40°C. continuous. A Westinghouse switchboard is provided with all necessary indicators, rheostats, and a watt-hour meter.

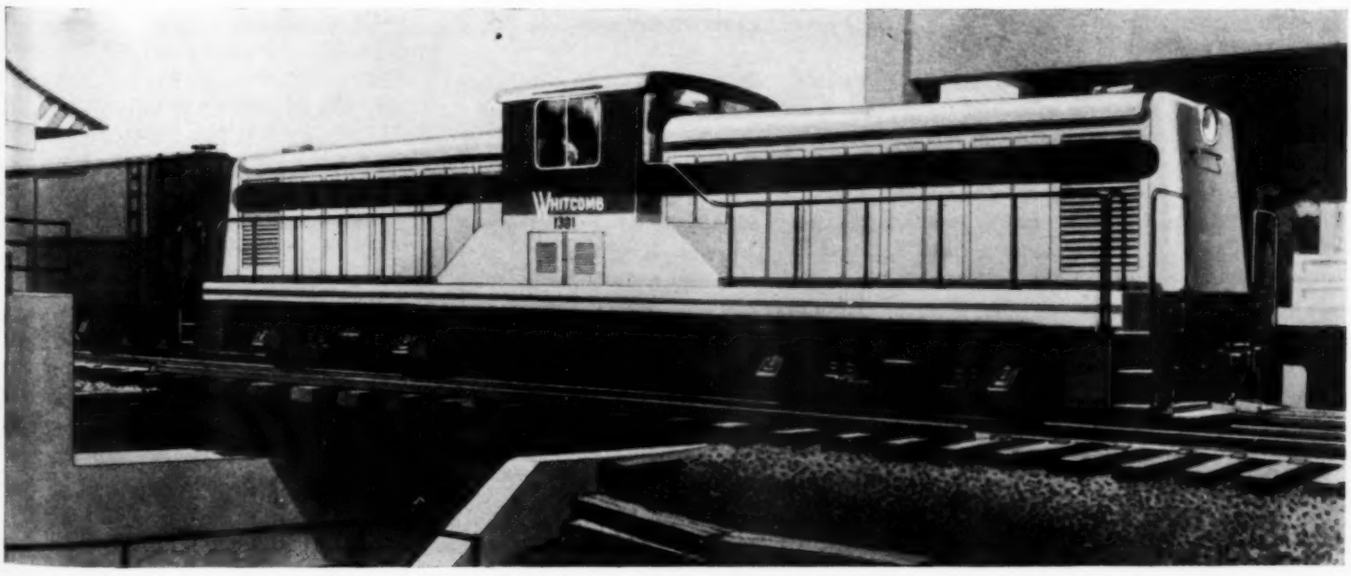
Air-starting is accomplished with a Wisconsin engine driving a Hayward Hallett two-stage compressor. Air is stored in a single, 8.75 cu. ft. tank attached to the steel base. Operating pressure is 250 lbs. sq. in.

NEW LOCOMOTIVES POWERED BY STERLING DIESELS

THE Whitcomb Locomotive Company has ordered 2½ million dollars worth of Sterling Viking Diesels for their locomotive building program. This program includes the building of a new series of streamlined Diesel-electric locomotives for American and foreign railroads.

A number of 80-ton locomotives with twin Sterling Viking Diesels will be delivered soon to Estrado de Ferro Sorocabana Railways of Brazil. Others of this same type are being consigned to railways in Colombia, Equador, Chile and Argentina.

Since the end af the war, many of this country's leading railroads have purchased Sterling Diesels. Among these are the Pennsylvania Railroad, Northern Pacific, and the Santa Fe, as well as the Chicago, Rock Island and Pacific and the Louisville and Nashville lines.



STANDARD PRACTICES FOR DIESEL ENGINES

CHAPTER ONE

Editor's Note: The following article is a reprint of the first chapter of the newly revised book "Standard Practices for Low and Medium Speed Stationary Diesel Engines" which was recently published by the Diesel Engine Manufacturers Association. Other chapters of the book will be reprinted in succeeding issues of DIESEL PROGRESS. *In answer to a growing demand for the revision of the 1935 edition, this book was published. It includes the refinements, new developments and changing procedures that have marked the advances of Diesel engineering in the past ten years. The aim of this book is to be of service to Diesel engine users, prospective buyers and consulting engineers. It covers stationary Diesel engines operating at speeds up to and including 750 rpm. The book is available to readers of* DIESEL PROGRESS *at the price of $2.50 plus mailing charges. Order your copy today from* DIESEL PROGRESS, *2 West 45th St., New York 19, N. Y.*

Definitions

1. Internal Combustion Engine.—An internal-combustion engine is any engine in which the working medium consists of the products of combustion of the air and fuel supplied. This combustion is usually effected within the working cylinder but may take place in an external chamber.

2. Diesel Engine.—A Diesel engine is an internal combustion engine in which the fuel is ignited entirely by the heat resulting from the compression of the air supplied for combustion.

3. Oil-Diesel Engine.—An oil-Diesel engine is one which operates on fuel oil injected after compression is practically completed.

4. Gas-Diesel Engine.—The gas-Diesel is an engine which operates on a combustible gas as primary fuel and in which the ignition of the gas is accomplished or aided by pilot-oil fuel injected after compression is practically completed. The gas fuel may be compressed in the engine cylinder with the air or it may be compressed separately and injected into the combustion chamber near the end of the compression stroke.

5. Dual Fuel Diesel Engine.—A dual fuel Diesel engine is one which may be operated as an oil-Diesel or a gas-Diesel engine or a combination of both, and is equipped with controls or parts to permit operating as one or the other.

6. Surface-Ignition Engine.—A surface-ignition engine is an internal combustion engine in which the ignition of the fuel is not accomplished solely by the heat resulting from the compression of the air supplied for combustion, but partly (or entirely) by another heat supplying agency or agencies, such as an uncooled tube, bulb or plate, or an electric resistance coil. In the strict sense, engines with spark ignition might come within the limits of this definition, but are specifically excluded. Other names by which this type engine has been called are hot bulb, hot head and semi-Diesel.

7. Cycle.—A cycle in an internal combustion engine is the complete series of events wherein induction and compression of air, burning of fuel, expansion and expulsion of the working medium are accomplished before repetition occurs.

8. Four-Cycle Engine.—An engine completing one cycle in four strokes or two revolutions is called a four-cycle engine. The cyclic events are designated by the following strokes: (1) Induction or suction stroke; (2) Compression stroke; (3) Expansion stroke, and (4) Exhaust stroke.

9. Two-Cycle Engine.—An engine completing one cycle in two strokes or one revolution is called a two-cycle engine. The cyclic events are designated by the following strokes: (1) Induction and compression stroke, and (2) Expansion and exhaust stroke.

10. Single Acting Engine.—An engine that utilizes the working medium on one side of a single piston is called a single acting, four or two cycle engine.

11. Double Acting Engine.—An engine that utilizes the working medium on both sides of a single piston is called a double acting, four or two cycle engine.

12. Opposed Piston Engine.—An engine utilizing the working medium simultaneously on two pistons in the same cylinder is called a four or two cycle opposed piston engine.

13. Trunk Piston Engine.—A trunk piston engine is an engine in which the connecting rod is connected directly to the wristpin in the piston. In this type of engine, the side thrust caused by the angularity of the connecting rod is taken by the piston bearing against the cylinder wall.

14. Crosshead Engine.—A crosshead engine is an engine in which the connecting rod is connected to a crosshead traveling in guides, and the crosshead in turn is connected to the corresponding piston. The side thrust caused by the angularity of the connecting rod is taken by the crosshead and guides.

15. Air Injection.—The term air injection refers to a method of introducing the fuel charge into the power cylinder of an engine. By this method a quantity of high-pressure air forces its way through a mechanically operated valve into the power cylinder by virtue of its margin of pressure over the compression pressure in the power cylinder, and carries with it the fuel charge.

16. Mechanical Injection.—The term mechanical injection refers to a method of introducing the fuel charge into the power cylinder of an engine. The injection system is completely filled with liquid fuel, and the fuel charge is injected into the power cylinder under pressure built up by a fuel pump. Mechanical injection systems may be subdivided into the following:

(a) Pump-timed injection system, in which the fuel is injected into the engine cylinder directly by the action of the fuel injection pump plunger. The action of the pump both meters and times the injection of the fuel.

(b) Pump-timed-injection system, with distributor, in which the fuel pump both times the injection and meters the fuel charge. The distributor is a selective device which determines the particular cylinder to which the fuel charge is delivered.

(c) Common-rail system, in which a fuel pump supplies fuel to a header, called the common-rail, at a pressure above the cylinder pressure of the engine, the fuel being passed from this common-rail to each cylinder in turn at the

proper time through mechanically operated valves.

(d) Controlled pressure-injection system, in which a fuel pump supplies fuel to a header or distributor at varying pressures, the fuel being metered to each power cylinder through injectors by mechanically operated valves which reduce the line pressure to a low value after each injection.

(e) Low pressure distributor injection system, in which a single pump plunger by means of a distributor delivers the fuel to multiple injectors, the timing and injection being accomplished by the action of the injector proper, and the pump and distributor serving only as a metering device at relatively low pressure.

17. Scavenging Air.—The term scavenging air refers to air at low pressure that is used for forcing the burnt gases out of the power cylinder of an engine during the exhaust period and, by this displacement, for furnishing a supply of fresh air for the cycle following. Scavenging air is sometimes employed for four-cycle engines and always for two-cycle engines.

a. The air may be compressed by any of the following methods:

(1) Separate scavenging, by which the air is compressed in a scavenging compressor or blower driven by an independent source of power.

(2) Integral scavenging, by which the air is compressed in a scavenging compressor or blower direct-connected, geared, or belted to the engine scavenged.

(3) Power-piston scavenging, by which the air is compressed in a chamber which is separated from the crankcase of the engine but which communicates with the end of the power piston remote from the combustion space. The upstrokes of the power piston draw air into this chamber from the atmosphere and the downstrokes compress the air so drawn in, with suitable air valving provided.

(4) Crankcase scavenging, by which the air is drawn from the atmosphere into the engine crankcase by the upstrokes of the power piston and compressed in the crankcase by the downstrokes of the piston, with suitable air valving provided.

b. Scavenging air may be introduced into the power cylinder by any of the following methods:

(1) Port scavenging, by which the scavenging air enters the cylinder of a two-cycle engine through a series of ports in the cylinder wall and forces the burnt gases through another series of ports into the exhaust line.

(2) Valve scavenging, by which the scavenging air enters the engine cylinder through a mechanically operated valve or valves, usually located in the cylinder head, and forces the burnt gases into the exhaust line, usually through a series of ports in the cylinder wall.

(3) Port and valve scavenging, in which the scavenging air enters the engine cylinder through a series of ports in the cylinder wall and forces the burnt gases through mechanically operated valve or valves in the cylinder head.

18. Supercharging.—The term supercharging refers to the practice of supplying the intake of an engine with air at a density greater than the density of the surrounding atmosphere, this increased density being retained in the cylinders at the start of the compression stroke.

The method of supercharging falls in two general classifications, namely:

(a) Turbine driven blower—With this method the exhaust gases from the engine cylinders are used to drive an exhaust gas turbine direct connected to a blower that supplies air to the engine intake manifold. There are no mechanical drive connections between the engine and turbine.

(b) Mechanically driven blower—The blower supplying air to the intake manifold may be driven direct from the engine or separately driven by an electric motor or other suitable prime mover. When separately driven, the

TABLE I—Fundamental Units and Constants

No.	Unit	Abbreviation or Symbol	Definition	Precise Equivalent Values	Approximate Values Acceptable for Computation
1.	Atmosphere, One Standard (international standard)	atm	760 mm mercury at ice point and standard gravity	29.921 in. mercury at ice point and standard gravity 14.6959 psi	29.92 14.7
2.	British Thermal Unit, One	Btu	251.996 It cal	778.26 ft-lb 0.293019 Int whr	778
3.	Calorie, One International Steam Table	It cal	1/860 International Watthour		
4.	Foot, One	ft	12/39.37 of the length of the international prototype meter (Legal Definition)		
5.	Foot-pound, One	ft-lb	Work done by 1 lb. force when its point of application moves one foot in the direction of the force	0.0003765 Int whr 0.00128491 Btu	
6.	Force, One Pound	lb	A force equal to the weight of one pound mass at a place where gravity has the standard value		
7.	Gravity, Acceleration due to Standard	g_c	32.1740 ft/sec^2	980.665 cm/sec^2	32.2 980
8.	Gallon, One U. S.	gal	231 cu in.		
9.	Horsepower, One	hp	33,000 ft-lb/min 550 ft-lb/sec	745.48 Int watts	745
10.	Horsepower Hour, One	hp-hr		0.74548 Int kwhr 2544.1 Btu	0.745
11.	Inch	in.		2.5400 cm	2.54
12.	Kilowatt, One Int	kw	1000 Int watts	3412.75 Btu/hr 737.78 ft-lb/sec	3413 738
13.	Kilowatt hour, One Int	kwhr	1000 Int whr	3412.75 Btu 2,656,000 ft-lb	3413 2,656,000
14.	Mass, One Pound	lb	0.4535924 times the mass of the international prototype kilogram		
15.	Pressure, Unit of	p	psi	2.036 in. mercury at ice point and standard gravity	
16.	Refrigeration, One Ton	ton refr	200 Btu/min	58.6038 Int whr/min.	
17.	Refrigeration, One Ton-day	ton-day refr	288,000 Btu	84389.472 Int whr	
18.	Temperature, Absolute	T	Degrees F + 459.69		Deg F + 460
19.	Watt, One Int	w	One Int Joule/sec	0.73778 ft-lb/sec 1.0003 abs w	0.738

additional power required to drive the blower is taken into account in determining the net brake horsepower rating of the engine.

It should be noted that while scavenging air is supplied to two cycle engines at a density greater than atmospheric, this practice does not supercharge an engine unless arrangements are made to retain a measure of the increased density in the power cylinders.

19. Force Feed Lubrication.—Force feed lubrication is that system of lubrication in which the lubricating oil is delivered under pressure produced directly by a metering pump, usually called a force feed lubricator.

20. Gravity Feed Lubrication.—Gravity feed lubrication is that system of lubrication in which the lubricating oil is delivered under pressure of gravity from an elevated supply.

21. Pressure Lubrication.—Pressure lubrication is that system of lubrication in which lubricating oil is delivered under controlled pressure produced by a non-metering pump.

22. Drop Feed Lubrication.—Drop feed lubrication is that system of lubrication in which the lubricating oil delivery is metered by regulating the number of drops per minute as observed through a sight feed.

23. Starting Air Compressor.—A starting air compressor is a compressor used to supply air at a pressure sufficient to start the engine for which it is an auxiilary. This air is stored in receivers sometimes called starting air tanks or starting air bottles. Compressors of this type may be single- or multi-stage.

24. Injection Air Compressor.—An injection air compressor is a compressor operated to furnish air at a pressure sufficient to inject fuel into the engine which it serves. Because of the high air pressure required, injection-air compressors are of the multi-stage type, with intercoolers between stages and an aftercooler following the high pressure stage.

25. Displacement.—(a) Engine Displacement per minute—The displacement per minute of an engine is the volume in cubic feet per minute which is swept by the piston (or all of the pistons, if more than one) during the power strokes, and is equal to: Number of cylinders times the area of the piston in square feet times the stroke in feet times the number of power strokes per minute.

(b) Engine Piston Displacement—Engine piston displacement is the cylinder volume in cubic inches swept by the pistons and is equal to: Number of cylinders times the area of each piston in square inches times the stroke in inches.

(c) Compressor Displacement and Capacity[1]—(1) Displacement of a compressor is the volume displaced per unit of time and is usually expressed in cubic feet per minute. In a reciprocating compressor it equals the net area of the compressor piston multiplied by the length of stroke and by the number of strokes per minute. The displacement rating of a multi-stage compressor is the displacement of the low pressure cylinder only.

(2) Capacity (Actual Delivery). The capacity of an air or gas compressor is the actual quantity of air or gas compressed and delivered expressed in cubic feet per minute at conditions of temperature and pressure prevailing at the compressor intake.

(3) Volumetric Efficiency is the ratio of the capacity of the compressor to the displacement of the compressor.

26. Horsepower.—One horsepower (hp) is a rate of doing work equal to 33,000 ft.-lb. per minute.

27. Indicated Horsepower.—The indicated horsepower (ihp) of an engine cylinder is the horsepower developed in the cylinder. It can be determined from the mean indicated pressure (see paragraph 28), the engine speed and the cylinder dimensions. The formula is:

$$ihp = \frac{mip \times L \times A \times N}{33{,}000}$$

where

mip = mean indicated pressure, psi.
L = stroke of piston, ft.
A = the net piston area, sq. in.
N = number of power strokes per minute.

28. Mean Indicated Pressure.—The mean indicated pressure (mip) is the algebraic sum of the mean pressures in pounds per square inch acting on the piston for each stroke during one complete cycle. Pressures are positive when acting in the direction the piston is moving and negative when opposite.

29. Brake Horsepower.—The brake horsepower (bhp) of an engine is the horsepower delivered by the shaft at the output end. The name is derived from the fact that it is determined by a brake. The formula is:

$$bhp = \frac{2 \times \pi \times r \times rpm \times W}{33{,}000}$$

where

r = distance between the shaft center and the point of application of the weight to the brake arm, ft.
rpm = revolutions per minute of the brake shaft.
W = effective weight on the brake arm, lb.
π = 3.1416

30. Brake Mean Effective Pressure.—Brake mean effective pressure (bmep) is:

$$bmep = \frac{bhp \times 33{,}000}{L \times A \times N}$$

where

bhp = brake horsepower per cylinder and L, A, and N, are as in the foregoing paragraph 27.

31. Piston-Speed.—The piston speed of an engine is the total feet of travel made by each piston in one minute. The formula is:

Piston Speed = stroke in feet × rpm × 2

32. Indicated Thermal Efficiency.—The indicated thermal efficiency of an engine is equal to the ratio of the heat equivalent of one horsepower hour to the number of heat units actually supplied per indicated horsepower hour. This may be calculated from either the high or low heat value of the fuel with proper designation as to which value is used.

33. Brake Thermal Efficiency.—The brake thermal efficiency of an engine is equal to the ratio of the heat equivalent of one horsepower hour to the number of heat units actually supplied per brake horsepower hour. This may be calculated from either the high or low heat value of the fuel, with proper designation as to which value is used.

34. Mechanical Efficiency.—Mechanical efficiency is the ratio of brake horsepower to indicated horsepower.

35. Horsepower Ratings.—All horsepower ratings herein, indicate the *usable* horsepower for the intended service.

36. The Diesel Engine Manufacturers Association hereby recognizes as standard the definitions of fundamental units and constants which are reprinted by permission from the "Code on Definitions and Values" for 1945, of the American Society of Mechanical Engineers.

[1] Reprinted from the Trade Standards adopted by the Compressed Air Society, Fifth Edition.

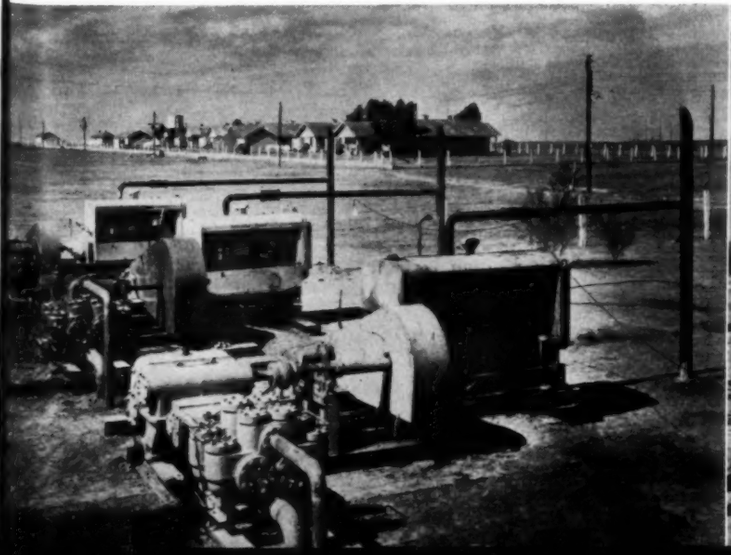
DIESELS CONTINUE INVASION OF TEXAS

Caterpillar Diesel tractor with LaPlant-Choate bulldozer clearing wooded land near Woodsboro, Texas.

Another shot of the Caterpillar Diesel grading a new road in the Texas fields.

These Caterpillar Diesels, used for standby power at a Texas pumping station, operate on crude oil.

View of a pipeline booster station located east of Whitsett, Texas. It is owned by the Humble Pipe Line Co. of Houston, Texas.



Conducted by R. L. GREGORY*

"TROUBLE SHOOTING" PART 7

Air Compressor

IN closing last month's article, the writer mentioned the fact, that trouble shooting on the air compressor covered a lot of ground and consequently this article would be devoted entirely to the air compressor troubles.

On air injection units, especially the larger unit types, two different types of compressors may be used, first, that driven directly off the crankshaft as shown in the accompanying cut, and second a separately driven unit, which is not an integral part of the unit.

On such a compressor as shown in the accompanying cut, there are three stages of compression, low, intermediate and high, with suction and discharge valves on each stage. The pistons of each stage are mounted on a common shaft, which also passes down through and carries the scavenging piston, and which piston rod is attached to the crosshead. This crosshead is driven by a connecting rod off the main crankshaft as shown. The pistons on the various stages are equipped with piston rings as shown at "A"—"B" and "C." The various valves are shown at "X"—"Y" and "Z."

Each stage is equipped with gauges which denote the pressures of the various stages, and by noting the operation of these gauges and the pressures maintained, one can easily discern whether the various valves are functioning normally.

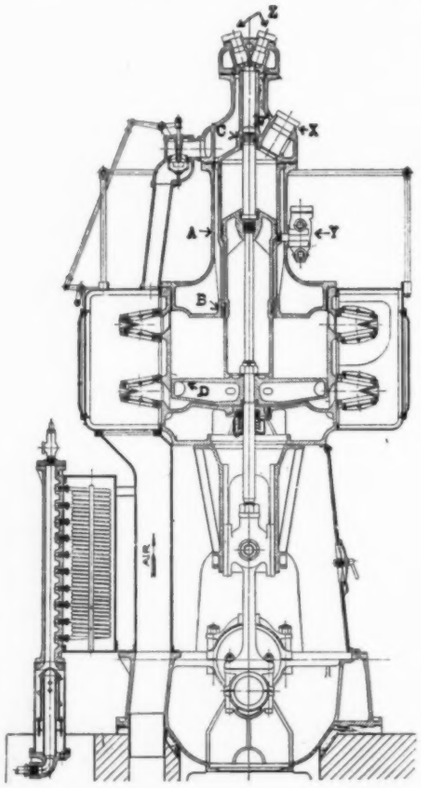
However by observing the pressures of the various stages, one can soon become accustomed to telling when the compressor is losing its efficiency and also which stage might be causing the trouble, since these gauges will denote whether there is any leakage from one stage to another. When the valves of the various stages are in perfect working order and one is still unable to maintain proper blast pressures, it is an indication that the piston rings have become worn and need replacing.

If normal injection pressure cannot be maintained, it may be due to any of the following causes:

1—Compressor valves may be broken or dirty.
2—Fuel valves may not be tight and may be leaking.
3—Air piping may be leaking.
4—Piston rings may not be functioning properly due to wear.
5—Pistons may not be tight on shaft.
6—If the pressure in any stage is below normal it is an indication that some valve is out of order.

Proper lubrication, not only as regards the quality of lubricant but also the quantity, as applied to the compressor has a lot to do with maintaining the valves of the various stages. Too much oil results in carbonization, and carbon is one of the worst enemies to these valves. It is therefore a good idea to make regular inspections of these valves. One way of insuring the proper functioning of the compressor valves is to keep extra sets on hand.

Cross section of Diesel showing air compressor.



all lapped in and ready for installation. When the inspection period arrives, remove all the valves from the various stages, clean the cages, inspect the gaskets, and when reassembling use all clean valves, with new gaskets.

Now I can hear some criticism of this method since some engineer will say: "What is the sense in removing a set of valves which are functioning perfectly." Well my reply to that would be, that perhaps the set of valves which are operating along perfectly today and have been for three or four months, may go to pieces tomorrow, so why risk the chance. These valves and the attendant springs are made of highly tempered metals, and there seems to be a tendency for both valves and springs to become brittle if used for too long a period. The valve seats are usually made of cast iron, and small bits of carbon and foreign material get under the valves, and while they eventually blowout and pass on, the cast iron seats become pitted and if let go too long eventually allow leakage.

During the past few years you have probably received valves and springs which are not as uniform as they were before the war. We received a shipment of valves, and when it came to lapping them in, one would lap in in a short time, while it would take two and three times as long to lap in the next one, using the same compound and the same method of lapping. We have taken valve springs from the same shipment, installed one in an intermediate suction valve and another in the other intermediate suction valve, and subjected them to the same period of operation. Upon removal the one spring would still maintain good tension, while the other would have but little tension. Well, this is a condition to be expected during war years, and if we continue to receive non-uniform materials, so much more cause for periodical changing whether they seem to function or not.

Now let us take up some of the conditions one might run into while operating:

1. Presume that everything is operating normally, when suddenly the relief valve on the low pressure stage blows. This valve is normally set to blow at 80 pounds or 30 pounds above maximum operating pressure in this stage. You might find that any one of the

* *Chief Engineer, Municipal Water and Light Plant, Hillsdale, Michigan.*

following would be the cause of such a condition:

a—Intermediate suction valve defective, thus allowing air from the intermediate stage to back into the low pressure stage.

b—Obstruction of the air passage in the low pressure cooler.

c—High pressure piston rings have become worn to such an extent that they have begun leaking.

d—Blowdown line from this stage of the cooler has become plugged and does not allow for proper blowing down of low pressure stage cooler, thus piling up this sludge and partially blocking air passage.

e—Defective relief valve.

2. Presume that the intermediate stage relief valve blows off, this valve being set at 280 pounds or also 30 pounds above maximum operating pressure of this stage which is 250 pounds:

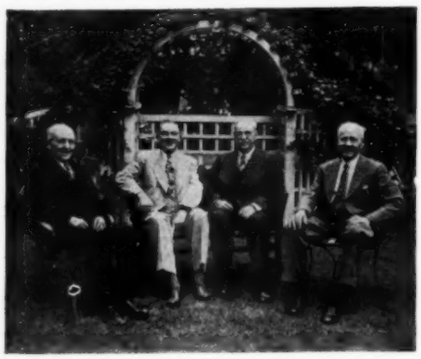
a—High pressure suction valve leaking and allowing high pressure air to back into intermediate stage.

b—Relief valve out of adjustment.

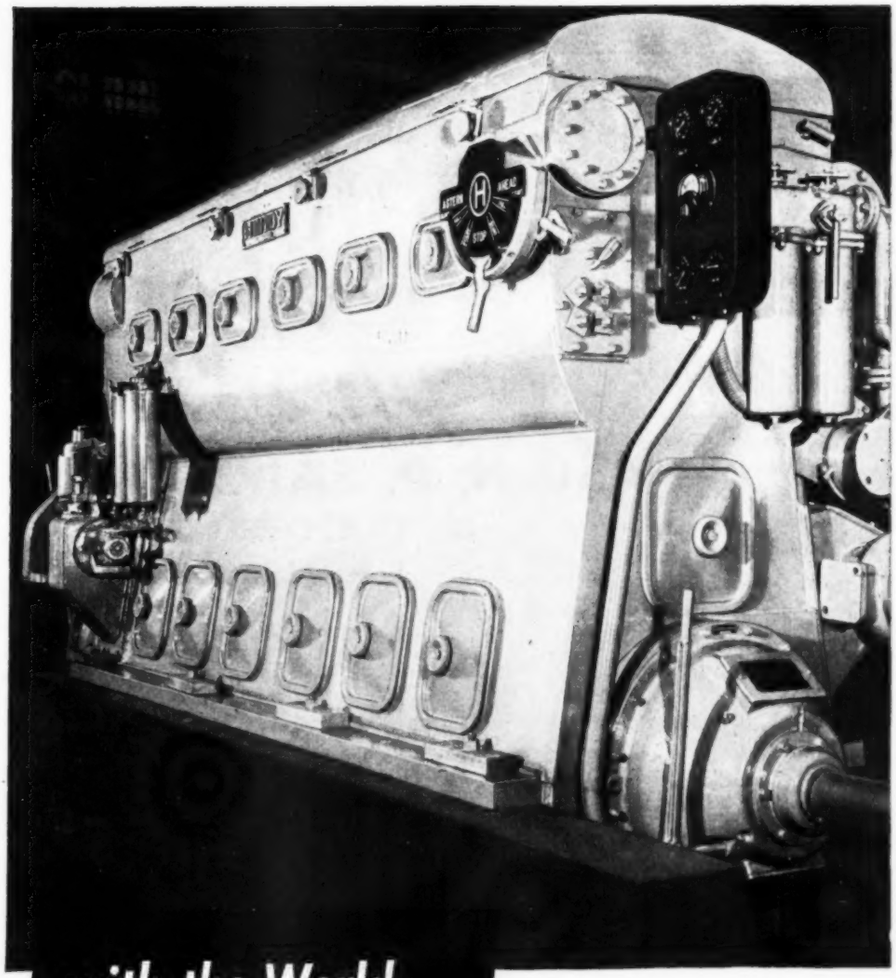
c—Intermediate stage blowdown lines become plugged causing obstruction in the air passage.

Inasmuch as space will not allow for a further discussion of the problems and maintenance of the compressor, this subject will be continued in the next issue.

Nordberg Half Century Club



The picture above was taken at a recent meeting of the Nordberg Half Century Club which is composed of Nordberg employees who have served with the company for 50 years. From left to right they are Hans Krogstad, Assembly Department, an employee for 54 years; E. C. Bayerlein, Chairman of the Board, who has been with the company for 52 years; L. C. Baumgarten, Installation and Service Engineer, 54 years with Nordberg; and Charles Poller, Traffic Manager, who has seen 52 years of service. These four men represent 212 years of employment and they have seen the company grow from a small establishment to a plant covering 45 acres and employing 2,000 men.



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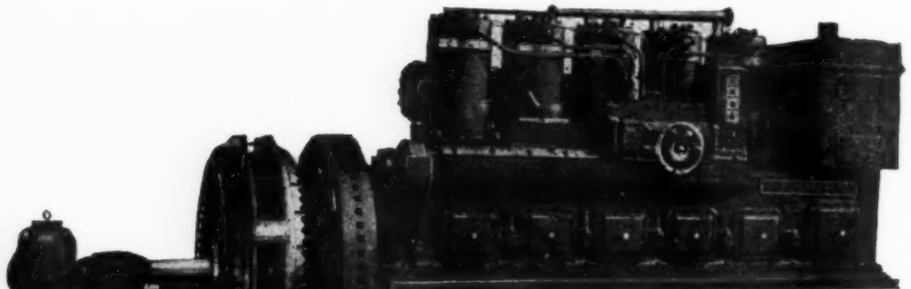

OTHER IMPORTANT OFFERINGS—

HP	MODEL	KVA	RPM	NEW
6-1600	General Motors	1200	720	90%
3- 900	Alco 540	750	600	95%
2- 600	Fairbanks 32F	500	400	99%
1- 450	Fairbanks 33	375	360	85%
1- 375	McIntosh-Seymour	375	360	85%
1- 360	Fairbanks YVA	300	257	80%
1- 350	General Motors	250	1200	85%
1- 240	Fairbanks YVA	200	257	75%
1- 150	General Motors	125	1200	85%

IMMEDIATE DELIVERY

HP	MODEL	KVA	RPM	NEW
2- 450	Buckeye 80	375	600	100%
2- 300	Buckeye 80	250	600	100%
1- 100	Buckeye "E"	250	400	98%
4- 225	Buckeye 80	187	600	100%
1- 225	Buckeye "E"	187	400	98%
1- 190	Buckeye "J"	125	514	98%
1- 112	Buckeye "E"	94	400	98%
1- 100	International UD18	62.5	1200	100%
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DIESELS Thats all!

Exchange Your Diesel Maintenance Ideas

Conducted by R. L. GREGORY

Editor's Note: In this department we provide a meeting place where Diesel and Gas engine operators may exchange mutually helpful maintenance experiences to keep our engines in top condition. Mr. Gregory edits your material and adds constructive suggestions from his own wide experience. This is your department—mail your contributions direct to DIESEL PROGRESS.

Utilizing Spare Moments

THE job of maintaining any sort of power plant equipment is a tedious one at best, especially with market conditions and deliverics as they are today. However, much can be done to alleviate the situation if all concerned will cooperate and work together on their maintenance problems.

One of the best ways to solve many a maintenance problem is to "Be Ready" for any emergency which may arise. Many a spare moment can be utilized along this line. Planning ahead and preparing equipment has shortened many an outage period when some unforeseen emergency has arisen.

For instance, not long ago an indicator card was taken for two cylinders on one of our units, and from this card it was found that the compression on these two particular cylinders was considerably lower than on the other cylinders, an indication that the piston rings were in need of attention. It has been our practice always to have two pistons in our stock, cleaned up, fitted with new rings and immediately available for any emergency. These pistons were brought down on the floor, all the tools necessary for the change gotten out, and everything gotten in readiness for the change.

When the opportune time came and load conditions permitted, the change was made in as short a time as possible and the unit was again ready for the line.

Our policy did not end here. Immediately on removal of the pistons with the defective rings, these pistons were placed on the basement floor and a workman put to work cleaning them up, removing the old rings and preparing them for the next required change. All the old carbon accumulation was removed, ring grooves thoroughly cleaned out, new rings procured from stock and checked up as to end clearance, and the cleaned pistons were then fitted up with the new rings, oiled up and placed in the stock room ready for the next change.

Ofttimes workmen find that they have an hour or two in which they seem to be pretty well caught up on available work. But there is always something that can be done. At such times, maintenance men can clean up valves, recondition them, and have a stock ahead ready for use. Another good way to make use of these spare moments is to be cleaning up, painting and wiping equipment, tools and other various jobs that, while they don't seem to be important in plant operation, are jobs that someone has to do. The average workman would much prefer to work with clean equipment, good extension cords, and in clean surroundings, than have to wade through dirt and grime, or use defective tools or tools coated with grease and oil.

If maintenance is going to be kept at its best, the better the working conditions. the better the resultant job. Too many workmen are prone to let the little things slip by unnoticed, but if slings, rigging materials and the ordinary equipment used in maintenance work are kept clean and in order, a much quicker and better job can be accomplished.

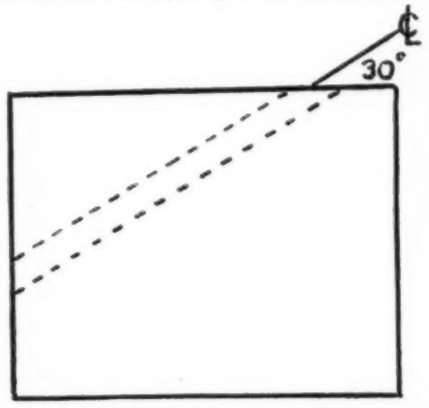
We all take a certain amount of pride in our surroundings, we want our homes neat and attractive and our home surroundings kept in order. How much more important is it then to see that our workshop, and our surroundings where we spend the greater portion of our days and the equipment with which we work is in order ready for the job. The best way to accomplish this is to apply those spare moments in keeping it that way.

The good maintenance man will look to the future and see that his house is in readiness for the emergency, his repairs and stock up to the minute in so far as he is capable of keeping it. So when you are not rushed with the job of actual maintenance, use the spare moments to get ready and prepared for the next emergency repair job.

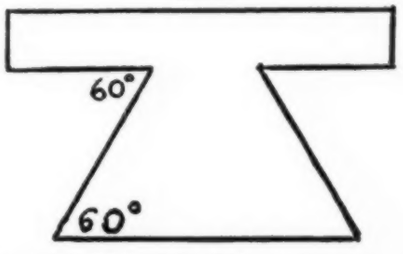
Gasket Splicing

Neat, precise and strong splices can be made in round rubber, or synthetic gasket materials by using a block of wood in which a hole, the size of the stock to be spliced, is drilled. This hole should enter the block at about a 30° angle, thus offering more surface to be cemented together than the often used 45° or straight joint. By using 2 smaller sized blocks, and drilling through, sanding or filing a small portion of either inside face, this holder will allow previously cut gaskets to be re-cut and also provides a handy clamp to hold the splice while the cement is setting.

Drilled block for splicing round gasket stock.

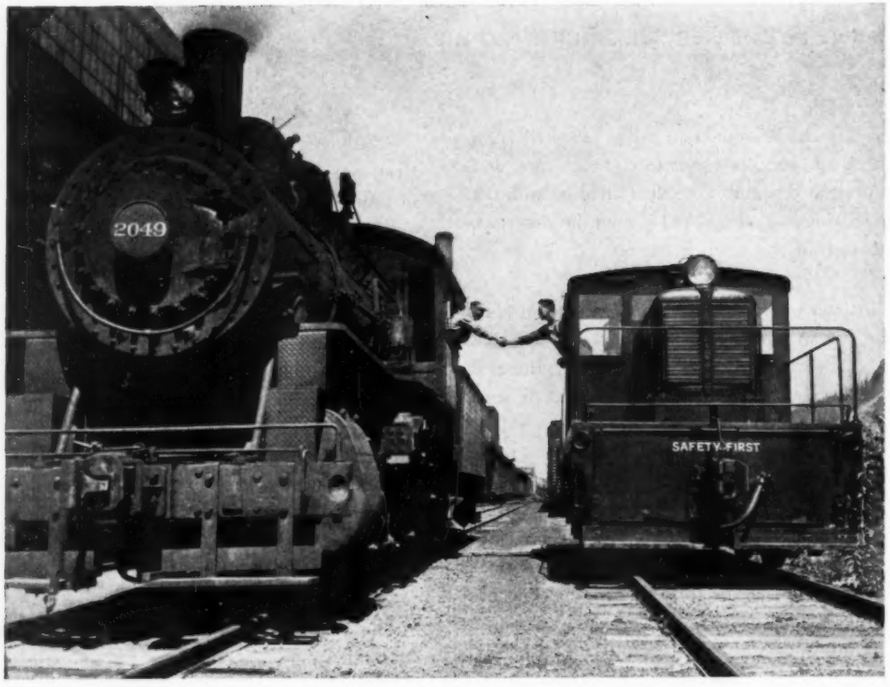


Sheetmetal template useful in making gasket splices.



In gasket making it is often necessary to use a splice because of the size of materials used or because of the need for large irregular shapes. A piece of sheet metal out of which is cut a male dovetail template makes for quick, symmetrical and strong splices. The template can be traced onto the material, or by holding firm or clamping, can be cut directly with a sharp tool. Avoid too large a dovetail and be sure to make the angles 60°. It is advisable to have several sizes of templates handy.

A HAND OF WELCOME FOR A DIESEL



THE W. F. Hall Printing Company of Chicago recently replaced its steam switching locomotive with a new Diesel-electric. The new locomotive, a Whitcomb, is powered by two Cummins Diesels which deliver a total of 300 hp. at their rated speed of 1800 rpm. The new locomotive weighs 50 tons, is an 0-4-4-0 type, 56½ in. gauge. It has Westinghouse electrical equipment including single station control, fully enclosed cab, Timken journal bearings, and straight and automatic air brakes. It meets full I.C.C. requirements. The gear ratio is 22.1 to 1 with a maximum permissible speed of 20 mph. The locomotive will be used in switching and shunting service in the yards and between the plant and the main line taking the place of the steam locomotive which was relieved of duty.

Engineer Thornton, piloting the steam locomotive, greets Fred Ekins, engineer of the new Whitcomb Diesel-electric which will replace the steamer for switching duty.

MANY OF THE WORLD'S FINEST DIESEL ENGINES ARE FACTORY-EQUIPPED WITH . . .

PIERCE GOVERNORS

★ For more than thirty years, Pierce engineers and field representatives have been meeting and solving difficult governing problems—and proving that *good* governing makes money for engine manufacturers and users alike.

That is the reason that Pierce Governors *are* standard equipment on many of the world's finest diesel engines—and the reason they are specified by thousands of engine users in all kinds of applications.

Pierce Diesel Governors are available in two general types—and many adaptations. They drive directly from the fuel pump—or independently of the fuel pump shaft. Both types are unsurpassed for accuracy and unfailing dependability—and trouble-free long-life. They often outlast the engines themselves without repair or readjustment. Wherever governing is required, *good* governing is best—and that means Pierce!

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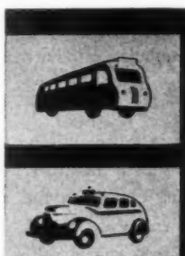
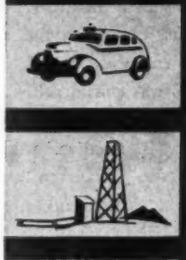
THE PIERCE GOVERNOR CO., INC. 1603 OHIO AVENUE ANDERSON, INDIANA

Manufacturers of Pierce Precision Governors and Sisson Automatic Chokes

Electro-Motive Appoints H. B. Ellis

APPOINTMENT of H. B. Ellis as Assistant to Vice President of General Motors is announced by C. R. Osborn, Vice President of General Motors and General Manager of Electro-Motive Division. Mr. Ellis has been Director of Parts and Service of Electro-Motive Division since 1944 and has been with Electro-Motive since 1926.

H. B. Ellis

Mr. Ellis joined Electro-Motive on April 15, 1926, after he had spent sixteen years with the White Motor Company and the Cleveland Tractor Company, as service manager for each company. In 1928 he was made assistant service manager of Electro-Motive and in 1930 became Service Manager.

Having headed Electro-Motive's service activities from the inception of the Diesel locomotive program he has been responsible for Elector-Motive's program to aid the development of modern maintenance facilities for American railroads. Among the more important of his many contributions has been the raised platform and depressed floor principle in layout of Diesel maintenance and repair shops which is embodied in practically all of the Diesel shops constructed within the past few years. Mr. Ellis also fathered and developed the Diesel Locomotive School at La Grange which, during the past twelve years, has given advanced training to more than 4,000 members of railroad maintenance supervision and elementary training to 65,000 other railroad personnel through the extension courses given on the Electro-Motive School Car.

IF YOU HAVEN'T ORDERED YOUR COPY OF THE 1946 DIESEL ENGINE CATALOG, VOL. 11, BETTER DO IT TODAY, SEE Page 107.

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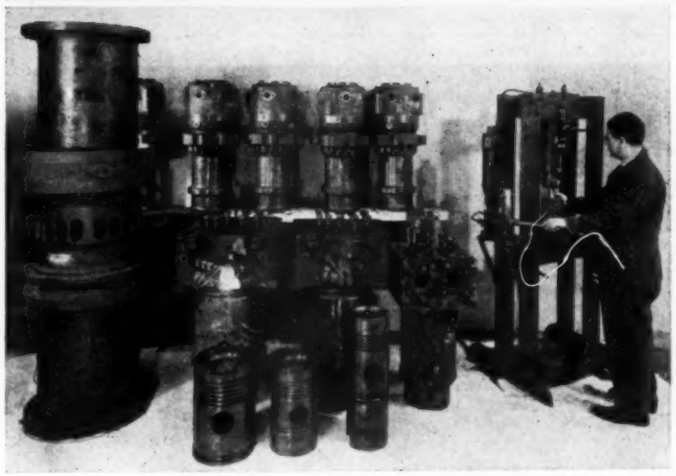

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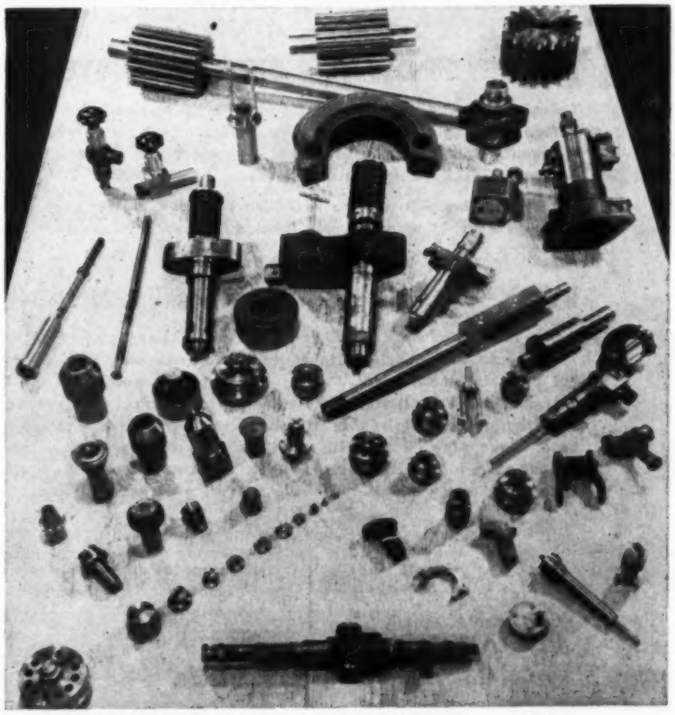


DIESEL SPECIALTIES, Inc.

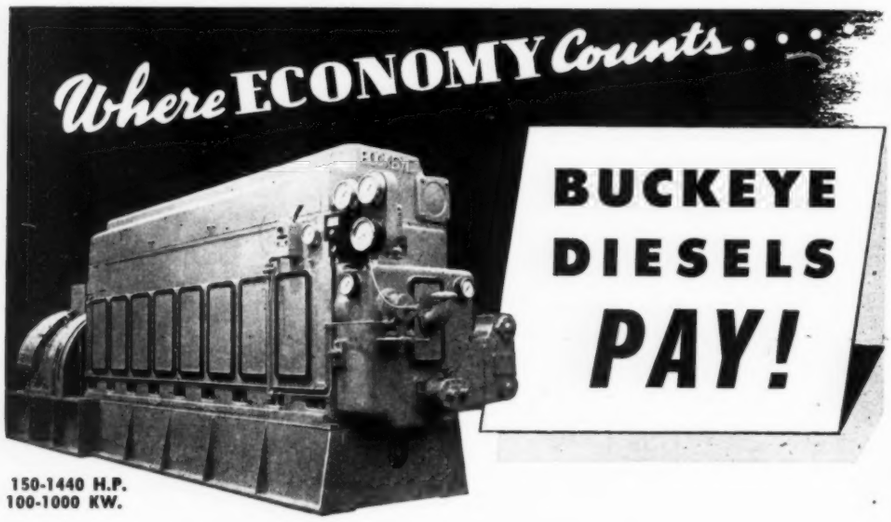
2 VAN DYKE ST. TELEPHONE: CUMBERLAND 6-3965 BROOKLYN, N. Y.

North Carolina State College Offers New Diesel Courses

THE Division of Diesel and Internal Combustion Engines at North Carolina State College, Raleigh, N. C., through its director, Prof. R. B. Rice, has just announced that in addition to regular courses open to undergraduates this year the division will offer two courses of study leading to a master's degree and two undergraduate short courses of 12 weeks each designed for students unable to pursue a full four-year course.

The first graduate program, leading to a master of science degree in Diesel engineering, stresses three phases of Diesel engineering. To be offered are Diesel power plant design and application, engine design, and experimental and research engineering. Classes are beginning this Fall and the first graduates are expected to complete their work in 1947. The program was mapped following conferences with Diesel engineering manufacturers on their needs.

The second course, leading to a master's degree is a five-year program, the first three years being devoted to fundamentals and pre-requisites for the last two leading to a prescribed professional degree. The program of study is based on requirements of industry and is designed to select men of real ability. The short courses, which started Sept. 20, offer beginning and advanced work.



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BUCKEYE POWER = EXTRA PROFITS

Today's narrowed profit margins make low cost power more important than ever before as a logical source of extra profits. Ever since 1908 — in thousands of stationary and marine installations — owners and operators have learned that the name "Buckeye" on an engine means ECONOMICAL POWER.

Buckeye owners will tell you that their savings in power cost represent a worthwhile profit that was formerly labeled "Operating Expense."

BUCKEYE ECONOMY and DEPENDABILITY

Every feature of Buckeye design and construction has been developed to bring the highest standards of dependability and economy to users of Diesel power. For example, Buckeye valve areas are larger because there are no valve cages. This increases combustion efficiency by providing faster air flow and quicker expulsion of gases. Crankshaft and connecting rod bearings are reversible, shell-type, silver alloy — made by an exclusive Buckeye process — and will last, with proper care, for the life of the engine. These and many other features are responsible for the low cost, dependable operation of Buckeye Diesels.

Buckeye engines are appreciated most where the going is tough . . . the service twenty-four hours a day . . . and a low cost source of dependable power is required.

Our engineering staff is always at your service. No obligation—no cost. Just write.

MARINE

"Be Profit-Wise and Dieselize with Buckeyes"

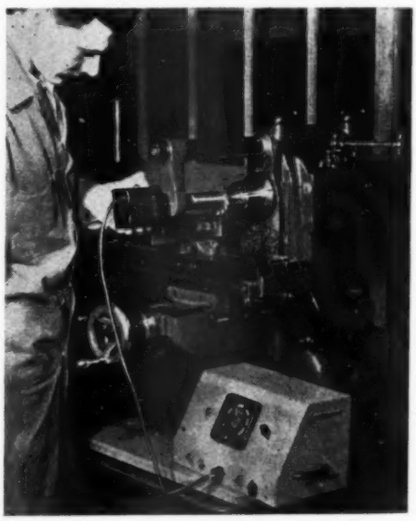
STATIONARY

Engine Builders Since 1908

THE BUCKEYE MACHINE CO.
LIMA . . . . . OHIO

New Electronic Tachometer Announced by General Electric

A NEW electronic tachometer designed for measuring rotating speeds from 300 to 50,000 rpm. has been announced by the Special Products Division of the General Electric Company. Weighing only 19 lb., the new tachometer is useful for the production testing of equipment instantaneously without the necessity for any permanent attachments. It can be used to indicate the speeds of electric motors, machine tools, automotive and aircraft engines, pumps, fans, blowers and other types of rotating equipment.

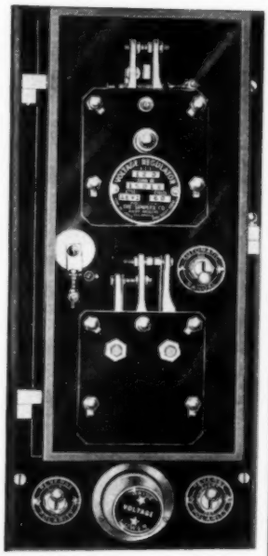


G.E. electronic tachometer being used to indicate rpm. of milling machine mandrel.

The electronic tachometer consists of a small pick-up head, six feet of flexible cable, and a measuring unit with a panel-mounted indicating instrument reading directly in rpm. Either a low-speed or high-speed head can be used with the instrument. The low-speed head provides five speed ranges, 0-1000, 0-2000, 0-5000, 0-10,000, and 0-20,000 rpm., while the high-speed head provides three speed ranges, 0-10,000, 0-20,000, and 0-50,000 rpm.

Each pick-up head consists of a light-interrupting disk and a phototube. Light shining upon the phototube through the openings in the rotating disk produces input signals which are then transferred to the measuring unit, which indicates the rpm. of the equipment.

SIMPLEX VOLTAGE REGULATORS



Alternating current generator owners throughout the world find great satisfaction in using SIMPLEX VOLTAGE REGULATORS in regulating the voltage of A.C. generators—Large and small.

For over twelve years SIMPLEX has enjoyed an enviable position in the manufacture of fine voltage regulators.

Post war type SIMPLEX VOLTAGE REGULATORS are as revolutionary in the field of voltage regulators as the ATOMIC energy is in the field of munitions.

SIMPLEX VOLTAGE REGULATORS are sold under a guarantee of satisfaction. Buy the LATEST AND BEST—it even costs LESS.

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by ORVILLE L. ADAMS, Sr.

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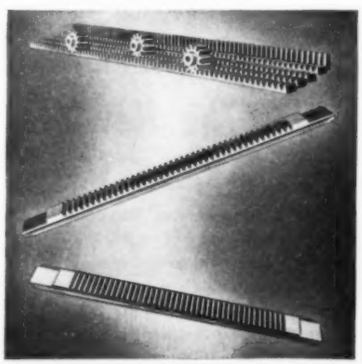

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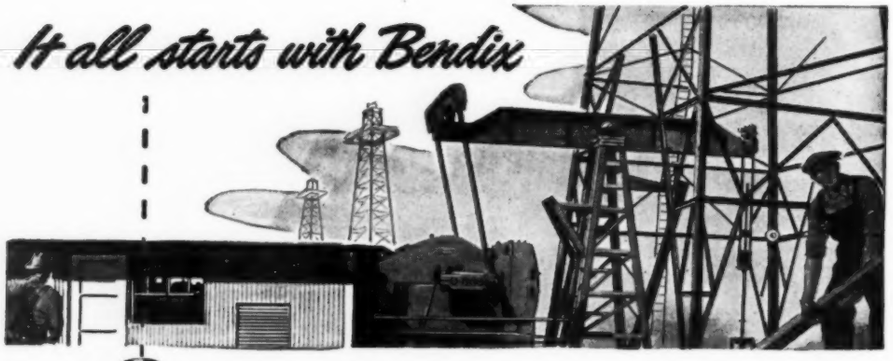

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Specifically designed for the task at hand—engineered to operate satisfactorily even under adverse working and weather conditions—Bendix Heavy-Duty Starter Drives are performance-proven in starting all types of industrial machinery.

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Allis-Chalmers Tractor Engineer to S.A.E. in '47

C. E. FRUDDEN, Consulting Engineer of the Allis-Chalmers Mfg. Co. Tractor Division, became the sole nominee for the 1947 national presidency of the Society of Automotive Engineers according to G. W. Curtis, general chairman of the society's eleventh annual tractor meeting recently concluded in Milwaukee, Wisconsin. The nomination is tantamount to election.

Mr. Frudden will be the first Wisconsin man and the first tractor man elected to the presidency of S.A.E. He will take office at the end of January and begin administering the affairs of the S.A.E. which is spread out over the United States, Canada and Hawaii.

S.A.E.'s new president, C. E. Frudden

Affable and mild mannered, Mr. Frudden has a long background of engineering experience. He took his engineering degree from Iowa State College and did graduate work at Columbia. He has submitted research papers to the S.A.E. and the American Society of Agricultural Engineers. He joined the Allis-Chalmers tractor organization in 1929, where he has been instrumental in effecting many of the remarkable advances apparent in the tractor field during the past 17 years. Shortly before the war he was promoted from Chief Engineer of the West Allis Tractor Division to Executive Engineer of the entire Allis-Chalmers Tractor Division.

Explaining that the automotive society is primarily a professional organization, Mr. Frudden pointed out how it stresses the discussion and exchange of information regarding various technical innovations. For example, the S.A.E. convention report concerning soil dynamics and its relations to the successful operation of motorized war equipment was expected to exert considerable influence on the designs of post-war tractors. The report listed the difficulties

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Formal announcement of Frudden's nomination occurred at the S.A.E. dinner-banquet, marking the end of the tractor meeting. Mr. Frudden, who received the best wishes of L. R. Buckendale of Timken-Detroit-Axle Co., retiring president, announced that he would strive to promote the society's educational facilities.

New Globe Factory at Olean, N. Y.

"TO meet the tremendously increased demand for Globe Roller Skates and Spark Plugs, we must provide additional production facilities," C. O. Wanvig, President of Globe-Union, Inc., recently announced. "Now that plans have been approved, erection of a new factory building at Olean, N. Y., will start immediately. A site of approximately 5 acres has been acquired which will adequately provide for the initial building, comprising 36,000 square feet, as well as additional space for building expansion and parking facilities. It is contemplated that about 200 people will be employed at Olean. In addition to our Milwaukee factory which manufactures Batteries, Centralab Radio Parts, Spark Plugs, and Roller Skates our eight other factories located at Boston, Philadelphia, Cincinnati, Atlanta, Memphis, Dallas, Los Angeles and Seattle, will continue production of batteries."

17th Power Show in New York December 2 to 7

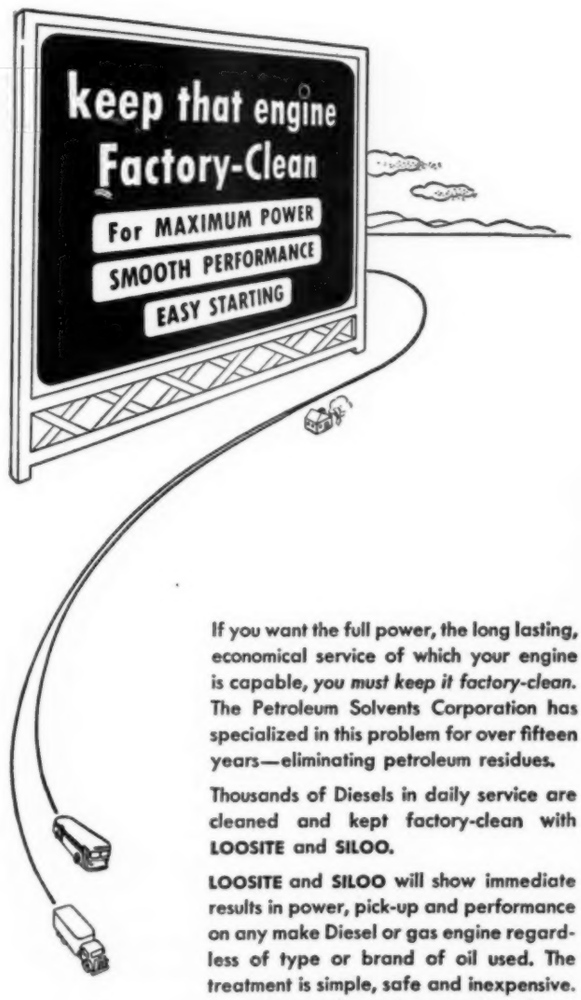
CONTINUED reorganization and expansion of industries everywhere will sustain a heavy demand for power equipment during many months to come, forecasting a period of steady employment and more settled business confidence. First reports from the list of almost 400 exhibitors booked for the 17th National Exposition of Power and Mechanical Engineering reveal a firm market for their products now with an increase in prospect when they can show their new lines. The Exposition is to be held in Grand Central Palace, New York, December 2 to 7.

New designs will be featured by most of the exhibitors, with emphasis on the use of specially selected materials including a number of the new special alloys, and, where weight saving is an object, combinations of light pressed steel shapes with aluminum and occasionally magnesium. Included in the great variety of instruments and special purpose appliances will be many which have a wide range of applications. For example, air-hydraulic presses may be used in assembling, embossing, crimping, riveting, heat sealing, marking of metals, leather and plastics; high-pressure pumps applicable to boiler feeds are aligned with pumps for injection molding, die casting, and numerous applications in steel and processing plants.

Charles F. Roth is manager of the Exposition. R. K. Stevens is associate manager.

"Katy" Line Orders Ten Diesel Switchers

THE Missouri-Kansas-Texas Railroad recently ordered ten new Diesel switchers for use at Fort Worth and Waco, Texas. Five of the new switchers, which will develop 1000 hp. each, will be built by the Baldwin Locomotive Works. The other five will be supplied by General Motors. According to Donald V. Fraser, president of the road, this purchase represents one more step in the direction of complete Dieselization of the road.



If you want the full power, the long lasting, economical service of which your engine is capable, *you must keep it factory-clean.* The Petroleum Solvents Corporation has specialized in this problem for over fifteen years—eliminating petroleum residues.

Thousands of Diesels in daily service are cleaned and kept factory-clean with **LOOSITE** and **SILOO.**

LOOSITE and **SILOO** will show immediate results in power, pick-up and performance on any make Diesel or gas engine regardless of type or brand of oil used. The treatment is simple, safe and inexpensive. See your supplier today or write to

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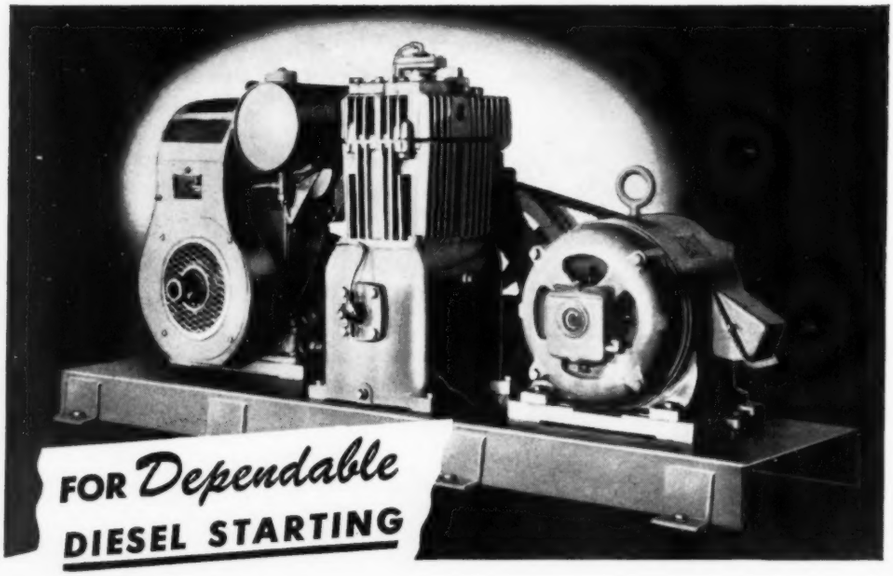
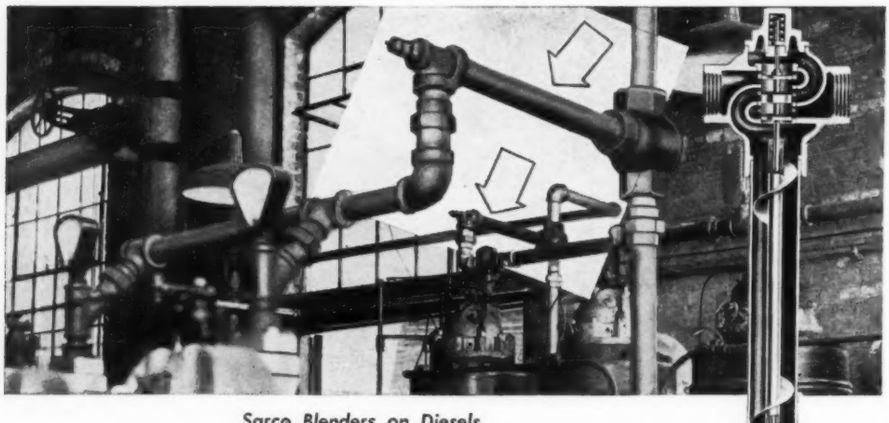
SILOO FUEL OIL TANK SOLVENT



Quincy Compressors for Diesel starting air supply are available in a wide variety of models. Model D320S shown above has proved highly satisfactory as a starting unit. Compressor can be operated by either electric motor or gasoline engine. This provides standby protection against current failure — eliminates extra investment in second compressor. Quincy Compressors are available in sizes 1 to 80 cu. ft. displacement, up to 500 pounds discharge pressure. Specify Quincy Compressors for *dependable Diesel starting.*

Quincy COMPRESSORS
QUINCY COMPRESSOR CO.
Department K-116, Quincy, Illinois
Branch Offices: New York • Chicago
St. Louis • San Francisco



Sarco Blenders on Diesels

LOW COST JACKET WATER CONTROL

Correct cooling water temperature benefits four ways—in engine efficiency, in amount of lubricating oil used, in the elimination of unnecessary shutdowns and repair bills, and in conservation of water supply.

The Sarco Blender is a simple, sturdy, three-way thermostatic mixing valve. It automatically recirculates a varying portion of the cooling water and maintains constant jacket water temperature.

Valves are of the double-ported, fully balanced piston type. Operation is unaffected by differing or fluctuating water pressures within reasonable limits. Sizes up to 6". Pressures to 150 lbs. Ask for Bulletin 700.

SARCO SAVES STEAM
SARCO COMPANY, INC.
475 Fifth Avenue, New York 17, N. Y.
SARCO CANADA, LTD., 85 Richmond St. W., TORONTO 1, ONT.

958

Fairbanks-Morse Appoints James G. Graham

V. H. PETERSON, Manager of the Railroad Division of Fairbanks, Morse & Co., announces the appointment of James G. Graham as District Manager of the Railroad Division of the company with headquarters in Chicago.

James G. Graham

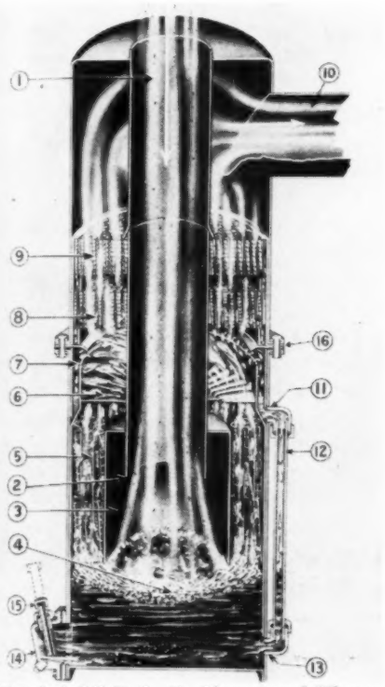
Mr. Graham has had a varied experience in the railroad industry. Following his education at Ohio State University and Drexel Institute, he joined the J. G. Brill Company of Pittsburgh and worked on their gas electric railroad cars. Later in the period from 1928 to 1932 he was in the operating department of the Baltimore & Ohio Railroad. From 1932 to 1938 he was with the New York Central Railroad as general agent of the freight department. Subsequently, he joined the Oliver Iron and Steel Corporation of Pittsburgh, and was general manager of their railroad sales.

He joined the Fairbanks-Morse organization as District Manager and will contact railroads in Chicago and West.

Waldron Issues New Catalog on Flexible Couplings

THE John Waldron Corporation recently issued a new descriptive catalog covering its new Series "A" couplings. Four standard and eight special type couplings are described. These gear-type couplings are built for a variety of applications in the Diesel field. Among these are generator, fan and pump drives. A special coupling designed for marine use can be furnished, as well as a Shear Pin Type Coupling for drives requiring a definite breaking point. Catalog #57 may be had upon request by writing the John Waldron Corporation, New Brunswick, New Jersey.

Continental Announces New Air Cleaner



Whirlwind Oil Bath Air Cleaner and Silencer.

A NEW air cleaner was announced recently by Continental Air Filters, Inc. The new cleaner, utilizing the oil bath principle, incorporates a visual means of checking oil circulation within the cleaner as well as an adjustable oil level gauge for checking the oil level. Air passes down through the center intake tube and impinges with the oil in the bottom. The oil-saturated air then is passed through coarse cloth. This action tends to force the dirt from the air into the oil. The oil is then separated from the air by its impact with a set of stationary vanes. The air then passes through another set of cloth filters and is discharged. The cleaner is easily demountable for inspection or repair by unbolting the top portion.

These Whirlwind cleaners are available in five sizes with capacities from 600 to 6500 cfm. Write Continental Air Filters, Inc., 2550 Helm Street, Louisville, Kentucky for further information.

Wilson, Panthofer Promoted at Perfex

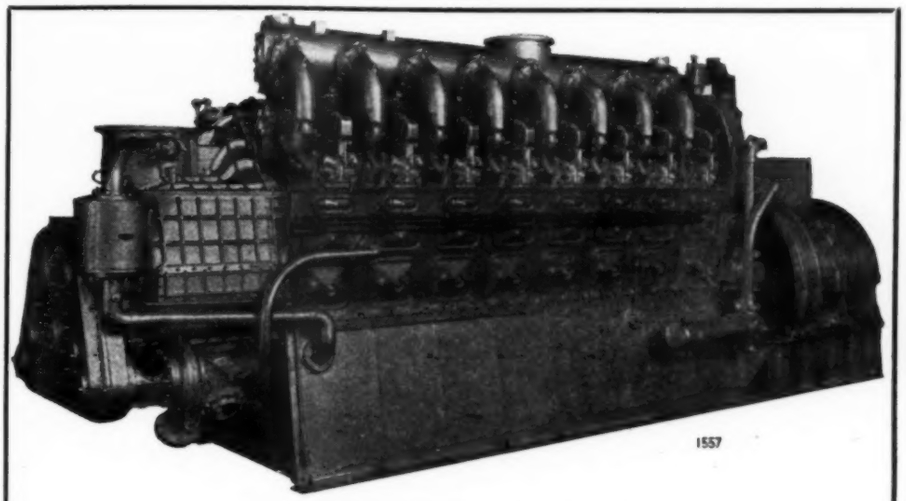
I. G. BOHRMAN, Vice President in charge of the Radiator Division of the Perfex Corporation, has announced the appointment of H. Russell Wilson as Sales Manager and Ernest H. Panthofer as Chief Engineer of that Division. Wilson is a veteran of 10½ years at Perfex. Before joining the Radiator Division 6 years ago, he held the position of Manager of Perfex Unit Heater Sales.

Panthofer, a University of Wisconsin graduate, joined Perfex in 1941. In 1943 he was placed in charge of Radiator Design and Research, and in 1944 he was named Staff Assistant to Bohrman.

New Development Engineer Joins Bowser, Inc.

J. C. LUNGERHAUSEN, a specialist in the design of positive displacement pumps, has joined the engineering staff of the Bowser, Inc., Industrial Pump Division, Fort Wayne, Indiana, in the capacity of Chief Development Engineer.

Mr. Lungerhausen is a graduate of Purdue University and has had many years experience in the development of pumps and hydraulic equipment. For the past five years he has been Development Engineer for the Blackmer Pump Company, Grand Rapids, Michigan.



1600 H.P. General Motors Model 16-278-A 720/750 rpm

93,780 DIESEL HORSE POWER—IMMEDIATE SHIPMENT

MARINE DIESEL—ELECTRIC UNITS—COMPLETE—1944 GENERAL MOTORS DIESELS—ALLIS CHALMERS—WESTINGHOUSE ELECTRICAL EQUIPMENT

6400 H.P. FOUR ENGINE UNIT—TWIN SCREW
3200 H.P. TWO ENGINE UNIT—SINGLE/TWIN SCREW
1600 H.P. SINGLE ENGINE UNIT—SINGLE SCREW

ENGINES, GENERATORS, PROPULSION MOTORS, CONTROLS, TAIL SHAFTS, BEARINGS, THRUSTS AND PROPELLORS.

A.C. DIESEL GENERATOR UNITS—60 CYCLE—50 CYCLE

KVA	H.P.	MAKE	RPM
2—1875	2000	FAIRBANKS	300
1—1250	1500	NELSECO	300
2—1250	1600	FAIRBANKS	720
18—1250	1600	GEN. MOTORS	720
4—1000	1200	GEN. MOTORS	600
1— 625	750	SUPERIOR	327
5— 375	450	GEN. MOTORS	600
2— 375	450	ALCO (MACK)	360
1— 375	450	ENTERPRISE	450
1— 300	360	FAIRBANKS	257
5— 250	300	GEN. MOTORS	900
4— 250	400	GEN. MOTORS	1200
2— 200	240	FAIRBANKS	257
1— 156	190	BUCKEYE	514
2— 127.5	165	MURPHY	1200
4— 125	150	GEN. MOTORS	1200
1— 92.5	112.5	BUCKEYE	400
18— 75	90	GEN. MOTORS	1200
15— 62.6	80	INTERNATIONAL	1200
30— 37.5	60	INTERNATIONAL	1200
3— 32	45	INTERNATIONAL	1200
28— 18.75	30	INTERNATIONAL	1200

D.C. DIESEL GENERATOR UNITS—2 WIRE—3 WIRE

KW	H.P.	MAKE	RPM
12—1000	1600	GEN. MOTORS	750
2— 800	1250	McINTOSH-SEY.	250
3— 500	750	GEN. MOTORS	750
3— 300	450	GEN. MOTORS	600
1— 300	450	GEN. MOTORS	1200
6— 275	440	COOPER BESS.	880
3— 250	450	ENTERPRISE	450
4— 250	450	WORTHINGTON	450
4— 100	150	SUPERIOR	1200

SMALLER UNITS TO 10 KW

PORTABLE POWER UNITS—15 H.P. to 400 H.P. RADIATOR COOLED — WITH CLUTCH POWER TAKE OFF

WHAT ARE YOUR REQUIREMENTS?

A. G. SCHOONMAKER COMPANY

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ENGINEERING— DIESEL ENGINES —SALES

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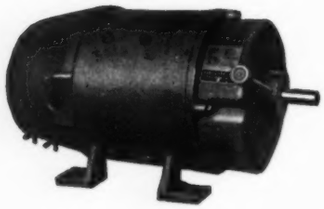
GENERATORS AC and DC



Well-known for their rugged design, efficient performance, long life and minimum maintenance, whether powered by electric, gasoline, or Diesel equipment. Backed by over ½ century of manufacturing and designing experience, Kurz and Root generators are now serving industries throughout the world.

DC generator (left) two - bearings, self excited type. Can also be furnished with direct connected exciter. Both AC and DC generators can be furnished in the single bearing, flange-mounted type for special mounting requirements. Ball bearing construction is used throughout. Complete data upon request.

Illustrated are AC generators, only 2 of the many different types developed and designed to fit specific needs and applications. (upper left) two-bearing self-excited type; (lower right) two-bearing, direct connected exciter type.

AC-DC GENERATORS

KURZ and ROOT Company

APPLETON · WISCONSIN

Since 1898

.....and DC motors and motor generator sets

MISOL

THE MILLER DIESEL FUEL ADDITIVE

THIS STARTLING NEW DISCOVERY GIVES YOU CLEAN FUEL SYSTEMS AND PEAK EFFICIENCY FROM TANK TO COMBUSTION CHAMBER.

SAFE AND ECONOMICAL

Descriptive Literature and full information on request

MILLER MANUFACTURING CO.

1100-1110 NORTH 32ND STREET CAMDEN, N. J.

National Motor Boat Show To Resume at Grand Central Palace, January 10-18

THE 37th annual National Motor Boat Show will be held at Grand Central Palace, January 10 to 18, 1947, it has been official.y announced by George W. Codrington, president of the National Association of Engine and Boat Manufacturers, sponsors of the exposition. The show will open Friday evening, January 10, and will run through Saturday, January 18, but will be closed Sunday, January 12.

In making the announcement, Mr. Codrington said that requests for space have been mounting steadily and that at least three floors of the Palace would be needed to properly display the postwar lines of hundreds of manufacturers of boats, marine engines and nautical equipment.

"The six-year pent-up demand of the boating public to see the show resumed is fully equalled by the enthusiasm of our members and the trade in general," said Mr. Codrington, "and I foresee one of the most complete expositions in the history of our show, which dates back to the old Madison Square Garden in 1905."

The last National Motor Boat Show was held in Grand Central Palace January 10-18, 1941, marking the 36th exposition under the auspices of the National Association of Engine and Boat Manufacturers. The first World War failed to halt the show in 1917 and 1918, and in 1920 two shows were held. Several months before the attack on Pearl Harbor, the National Association's executives decided against holding the exposition in 1942.

The National Motor Boat Shows, held in Grand Central Palace since 1916, have provided one of the nation's outstanding expositions, attracting yearly thousands of visitors, many from distant sections of the country. As in the past, the 1947 show will serve as a focal point for conventions of national boating groups, meetings of racing rules committees and similar gatherings. The 1947 annual meeting of the American Power Boat Association, governing body of motor boat racing in this country, will be held during the coming show.

Apologies to G. E.

IN the lead article of the September issue of DIESEL PROGRESS entitled "New Diesel Tugs for Navy," no mention was made of the manufacturer of the electrical equipment aboard these vessels. The complete electrical installation was made by the General Electric Company.

Briggs A
Manager

Walter B.
Power Tra
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Flexible Co

Diesel C
Compara

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various Ma
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Cooling W

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Briggs Appointed General Manager by Lovejoy Company

Walter B. Briggs, formerly Manager of the Power Transmission Division of Ideal Industries, Inc., has been appointed General Manager, Power Transmission Division of Lovejoy Flexible Coupling Co.

Diesel Cooling Water Comparator for Marine Use

HOW Diesel Engine Cooling Systems can be safeguarded with Dearborn Cooling Water Comparator plus Dearborn Treatment is described in a recent bulletin issued by the Marine Division of the Dearborn Chemical Company. This pamphlet is available through their various Marine offices and is used in conjunction with Dearborn Engineering Service.

The comparator illustrated here and also in the bulletin is a compact duplex unit containing Chromate and pH Standards calibrated for use with the standard types of Dearborn Diesel Cooling Water Treatment.

Frequent checking of the jacket water with this visual unit gives an accurate indication of the treatment adjustment required to keep the system both corrosion and scale-free.

Penn Electric Opens Additional Factory

A NEW factory building at Indianapolis, Indiana has been leased by Penn Electric Switch Co. This latest acquisition boosts the company's total to three factories. The second factory was put into operation on January 1 in Toronto, Canada.

According to Albert Penn, president, the additional manufacturing space is but another step in the company's expansion program designed to give faster deliveries and more efficient service to its customers. Production in the new plant is expected to start shortly after October 1.

The Indianapolis plant will fabricate and assemble some of Penn's present line of controls as well as new products recently developed.

Correction Please

WE were misinformed as to the make of the lube oil purifier installed on the new Diesel-electric ferry *The Narrows*, which was described in the October issue of DIESEL PROGRESS. This equipment is of Sharples manufacture.

LET US SEND YOU

the Story of

"$75,000.00

...that didn't go up in smoke"

One of the many leading railroads having installed the Bearing Watchdog System in its Diesel locomotives recently reported savings of more than $75,000.00 in maintenance and repairs credited to the system. This report is presented in a folder titled "75 Thousand Dollars That Didn't Go Up In Smoke." It outlines briefly how you, too, can cut Diesel maintenance and repair costs. We'd like to send the folder to you free, without obligation on your part.

paxton
DIESEL ENGINEERING COMPANY
OMAHA 5, NEBR.

Mail this coupon today for free folder

GET THE DETAILS
on the
Bearing Watchdog System
— Crankshaft Protector

Paxton Diesel Engineering Co.
Omaha 5, Nebraska

Please send me the new folder on the Bearing Watchdog System, titled "75 Thousand Dollars That Didn't Go Up In Smoke."

NAME .....
ADDRESS .....
CITY ..... STATE .....
FIRM ..... POSITION .....

HOLD Compression!
WITH THE
AUTO-DIESEL Helicam
GAPLESS
PISTON RING

HOLD compression . . . STOP blow bys with the Auto-Diesel Helicam GAPLESS Piston Ring. It's made up of two IDENTICAL interlocking parts that fit together to form a ring without a gap. Tension . . . flatness . . . circularity . . . and close dimensional limits assure the perfect seal needed for smooth, full flow of power. Sizes 1" to 35" for original equipment or replacement in Diesel units, and for pneumatic and hydraulic equipment. Used also for oil rings . . . for contracting rings for sealing shafts, bearings, etc. We also make conventional type rings.

Write for information.

THE AUTO-DIESEL PISTON RING CO.
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QUALITY RINGS SINCE 1921

New DIESELS
Immediate DELIVERY

ENGINE GENERATORS
- 100 KW HERCULES
- 60 KW OIL WELL WEBER
- 40 KW HERCULES
- 30 KW GENERAL MOTORS
- 25 KW HILL
- 30 KW INTERNATIONAL

INDUSTRIAL ENGINES
- 75 HP CHRYSLER
- 9 HP WITTE
- 6 HP WITTE

MARINE ENGINES
- 165 HP GENERAL MOTORS 2:1, or 2.5:1, or 1:1.25
- 125 HP MACK-LANOVA 2:1
- 120 HP BUDA 2:1
- 125 HP HERCULES 1.5:1

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Benjamin's for Motors
130 CLINTON STREET
BROOKLYN 2, NEW YORK
MAIN 4-5181

New Caterpillar Booklet

THE basic zones recognized in modern problems of earthmoving are defined and the types of equipment suitable to each are outlined in an instructional booklet, "The 1-2-3 of Zoned Equipment."

Delineation of the zones in which power equipment, slow speed hauling equipment and high speed hauling equipment are utilized for maximum productivity provides the theme of this illustrated publication. How "Caterpillar" products meet these zone requirements and how they adapt themselves to in-between cases, is shown.

Copies of the booklet (Form 9487) may be obtained from the Caterpillar Tractor Co., Peoria 8, Illinois.

The
CLEVELAND DIESEL
ENGINE DIVISION
of
GENERAL MOTORS
Presents
THE
MODERN MARINER

A New Picture... SHIPS TALK ...INANIMATE OBJECTS Come to Life and Give You a Piece of Their Mind...
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PUBLIC RELATIONS DEPT.
CLEVELAND DIESEL ENGINE DIV.
16 MM 35 MM
A Most Unusual Moving Picture!

WITTE DIESELS

Engine Sizes	Dieselectric Plant A.C.	Sizes D.C.
4 H.P.	3 KVA	2.5 KW
6 H.P.	5 KVA	4 KW
9 H.P.	7.5 KVA	6 KW
12 H.P.	10 KVA	8 KW

WRITE FOR DESCRIPTIVE WITTE LITERATURE

Close regulating and constant voltage generators.

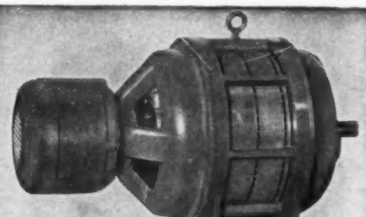
WITTE ENGINE WORKS
DIVISION OF OIL WELL SUPPLY COMPANY — UNITED STATES STEEL CORPORATION SUBSIDIARY

YOU SAVE TWO WAYS with TUTHILL
General Purpose Pumps

They're low in first cost. They're engineered for long service with negligible maintenance. In these two ways Tuthill Model C pumps save you money in general purpose service on non-corrosive liquids. These compact, rugged pumps operate efficiently in either direction of rotation. Capacities from 1 to 200 g.p.m. Pressures up to 100 p.s.i. Direct drive, V-belt units and stripped models available.

Write for Model C Bulletin

TUTHILL PUMP COMPANY
939 East 95th Street • Chicago 19, Illinois



Columbia A.C. and D.C. Generators are built to meet highest performance standards. Complete range of application, including light, power, ship auxiliaries, or custom designed units.

D.C. UNITS range from 7½ to 200 KW.
A.C. UNITS range from 6¼ to 300 KVA.
Speeds and other specifications to meet requirements. Write for full information.

COLUMBIA ELECTRIC MFG. CO.
4519 Hamilton Ave., N.E., Cleveland 14, Ohio

COLUMBIA
GENERATORS
A.C. and D.C.

Naval Architects Meet in November

THE Fifty-fourth Annual Meeting of the Society of Naval Architects and Marine Engineers will meet at the Waldorf-Astoria, November 13-14-15 and 16th, opening with a session in the Jade Room when the president's address and the Annual Report of the Secretary-Treasurer will be read. Following the morning session, the following papers will be submitted for discussion:

1. "Design of Stacks to Minimize Smoke Nuisance," by Robert W. Nolan, Member.

2. "German Wartime Technical Developments," by Commodore H. A. Schade, U.S.N., Member.

The Second Technical Session will be held at 2:00 P.M. in the afternoon at which time the following papers will be read:

3. "Development of Ice Breaking Vessels for the United States Coast Guard," by Rear Admiral Harvey F. Johnson, U.S.C.G., (Ret.), Council Member.

4. "Turning and Course-Keeping Qualities," by Professor Kenneth S. M. Davidson, Member, and Dr. Leonard I. Schiff, Visitor.

The Third Session will be held Friday morning, November 15, at which time the following papers will be presented for discussion:

5. "Alternating Current for Auxiliary Plants of Merchant Vessels," by Benjamin Fox and Harry C. Coleman, Members.

6. "Development of Steam Turbines for Main Propulsion of High-Powered Combatant Ships," by Glenn B. Warren, Member.

The Fourth Session will be held in the afternoon of the same day, at which the following papers will be presented:

7. "Aspects of Large Passenger Liner Design," by James L. Bates and I. J. Wanless, Members.

8. "A Pattern for Research in Naval Architecture," by Commander E. A. Wright, U.S.N., Member.

The Fifty-fourth Annual Banquet of the Society will be held in the Grand Ballroom of the Waldorf, Friday evening, November 15, and the Annual Dinner Dance will be held Saturday evening, November 16.

U.S. INSTRUMENTS Tell The Truth

USG

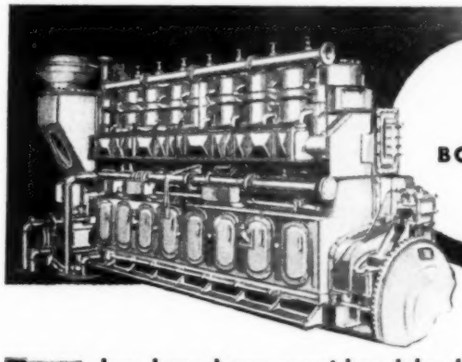
PRESSURE, TEMPERATURE, FLOW, ELECTRICAL AND LEVEL MEASURING INSTRUMENTS

UNITED STATES GAUGE

6 out of 10 manufacturers of original equipment specify U.S.G.

DIVISION OF AMERICAN MACHINE AND METALS, INC.

SELLERSVILLE, PENNSYLVANIA (13)



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ERIE has long been considered by leading manufacturers of heavy equipment as their source for special bolts and studs made from high carbon and alloy steels. Quality, rather than quantity, has always been stressed. In working closely with leading *diesel* manufacturers, ERIE has become well recognized as the outstanding manufacturer of specials where high tensile strength and close tolerances are essential factors. When high quality bolting is required together with lasting economy, you can depend on ERIE to furnish you the product which will meet your specifications.

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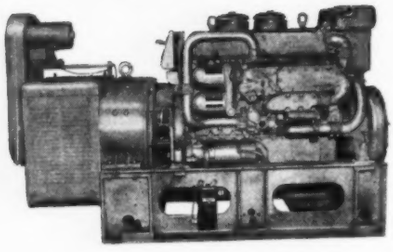
STUDS • BOLTS • NUTS ~ ~ ALLOYS • STAINLESS • CARBON • BRONZE

Auxiliary
DIESEL POWER



STAR ELECTRIC GENERATOR . . . Type SQ-55L
driven by HERCULES Diesel Engine Model DWXD

NEW IMMEDIATE DELIVERY

- Volts 120 D.C.
- Amps. 333
- K.W. 40
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TORRINGTON, CONN.
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FITZGERALD
SINCE 1906 GASKETS
THE COMPLETE LINE THAT COMPLETELY SATISFIES

Hercules Opens West Coast Factory Branch

HERCULES Motors Corporation recently announced the opening of a direct factory branch on the West Coast to broaden its program of supplying engines, power units and replacement parts to users, manufacturers and dealers throughout the western part of the country.

W. W. Cromley, Vice-President in charge of West Coast Operations, is located in Los Angeles, at the factory branch which is located at 2065 East Thirty-seventh Street. Warehouse facilities have been built at this location.

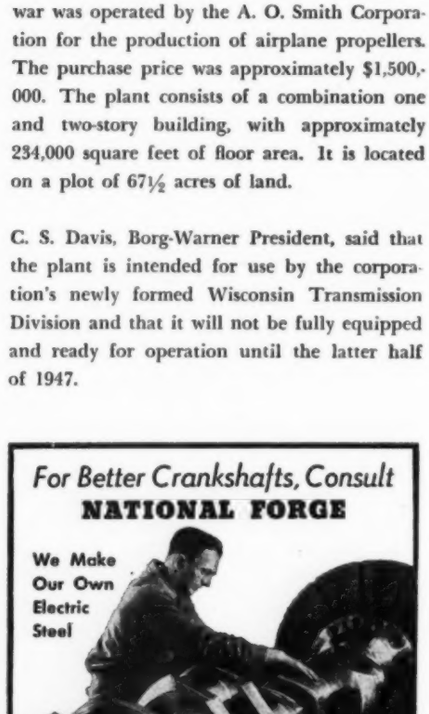
In addition to the factory branch, a group of prominent distributors strategically located to serve Arizona, Oregon, Washington, California, Colorado, Idaho and as far north as British Columbia, Canada, has been appointed by Hercules.

Borg-Warner Buys Surplus Government Plant

BORG-WARNER Corporation announced recently the purchase from the War Assets Administration of the manufacturing plant in Milwaukee County, Wisconsin, which during the war was operated by the A. O. Smith Corporation for the production of airplane propellers. The purchase price was approximately $1,500,000. The plant consists of a combination one and two-story building, with approximately 234,000 square feet of floor area. It is located on a plot of 67½ acres of land.

C. S. Davis, Borg-Warner President, said that the plant is intended for use by the corporation's newly formed Wisconsin Transmission Division and that it will not be fully equipped and ready for operation until the latter half of 1947.

For Better Crankshafts, Consult
NATIONAL FORGE



OAKITE SHORT-CUTS to Diesel cleaning

Air Compressor Valves Quickly Cleaned!

You get top-flight operating efficiency from your Diesel engines when you keep air compressor valves *clean!* To remove all accumulated carbon and other impeding deposits effectively, soak valves in hot solution of recommended Oakite cleaning material. Then brush-rinse. Valves come out clean, bright and ready once again to operate smoothly . . . maintain correct compression.

Send today for full details. There is no obligation.

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Technical Service Representatives in Principal Cities of the U. S. and Canada

OAKITE Specialized CLEANING
MATERIALS METHODS SERVICE FOR EVERY CLEANING REQUIREMENT

Write for Bulletin
CHECK YOUR FUEL SUPPLY AT A GLANCE

THE LIQUIDOMETER CORP.
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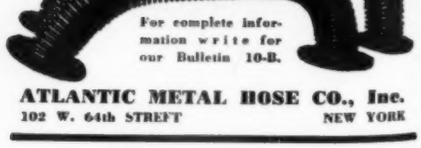
Atlantic Seamless Flexible Metal Hose

is highly recommended by leading Diesel Engine Manufacturers, Naval Architects and Engineers for

Diesel Exhaust and Air Intake

Absorbs vibration. Can't leak or burn out. No joints to loosen. No packing to rely on for tightness. In sizes 1" to 36" I.D., inclusive. With forged steel flanges or nipples in lengths desired, straight or bent to your specifications. Atlantic Hose is widely used in Industrial Plants, on Railroads, in Marine service and by the United States Navy.



ATLANTIC METAL HOSE CO., Inc.
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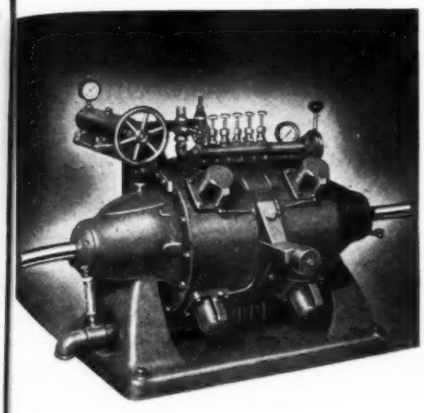

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DYNAMOMETER *with* PRONY BRAKE

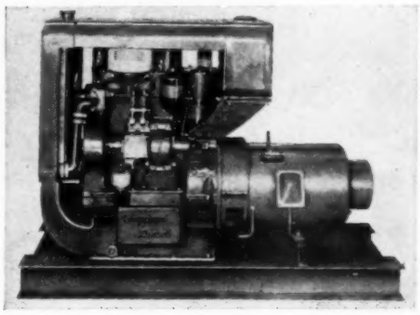
High-torque testing at speeds right down to zero R.P.M.! That is what you can do with the combination of hydraulic dynamometer and Prony brake — an exclusive *HI-EFF* feature. In addition to the standard hydraulic rotors for high and medium-speed testing, low-speed brake drums are an integral part of the dynamometer . . . both cooled by the same circulating water. This unique arrangement results in an exceptionally wide range of speed and B.H.P. capacity in one machine —greatly broadens the possible testing range. The hydraulic rotors may be operated alone, the Prony brake operated alone, or both rotors and brake operated in combination.

If you are faced with a low-speed, high-torque testing problem, or if you are in need of a dynamometer with the widest range of testing capacities, let us give you details of *HI-EFF* applications — probably some similar to your requirements. Taylor Manufacturing Co., 3082 W. Meinecke Ave., Milwaukee 10, Wis.

TAYLOR OF MILWAUKEE

MANUFACTURERS OF "HI-EFF" HYDRAULIC DYNAMOMETERS — STATIC BALANCING MACHINES — SENSITIVE DRILLING MACHINES

"Regulectric" Generators Now Standard Equipment for Sheppard AC Sets



Sheppard Diesel generating set equipped with "Regulectric" Generator.

THE R. H. Sheppard Company has standardized on "Regulectric" generators for its AC Diesel-electric generating units. The "Regulectric" generator was developed by the Electric Machinery Company and has been discussed at length in previous issues of DIESEL PROGRESS. The "Regulectric" system provides the answer to the old problem of droopy voltage in small generator installations through a novel built-in generator circuit which is sensitive to small changes in generator voltage.

The Sheppard Company has adopted this new-type generator for their Diesel-driven AC generating sets of 5 to 15 kw. capacity.

Multiple Uses for Truck Mounted Diesel Unit

Two pictures above show two of the uses to which a truck-mounted General Motors Diesel was put recently. The unit, originally purchased to power a sawmill, is seen in the top picture mounted on an army truck. It is driving a corn shredder. The lower photograph shows the same outfit shredding ensilage. When shredding corn the Diesel operates at a fuel costs of 11 cents an hour. Alvin B. Hafer, operator of the rig claims that the Diesel does jobs faster and more economically than any other type of power.

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Yes, *your* standards are *our* standards. You have, for years, supplied us with outstanding men from which to mould our faculty. You have selected equipment for *us* on which to train men for *you*. You have been free with technical information—the result of your own endless research.

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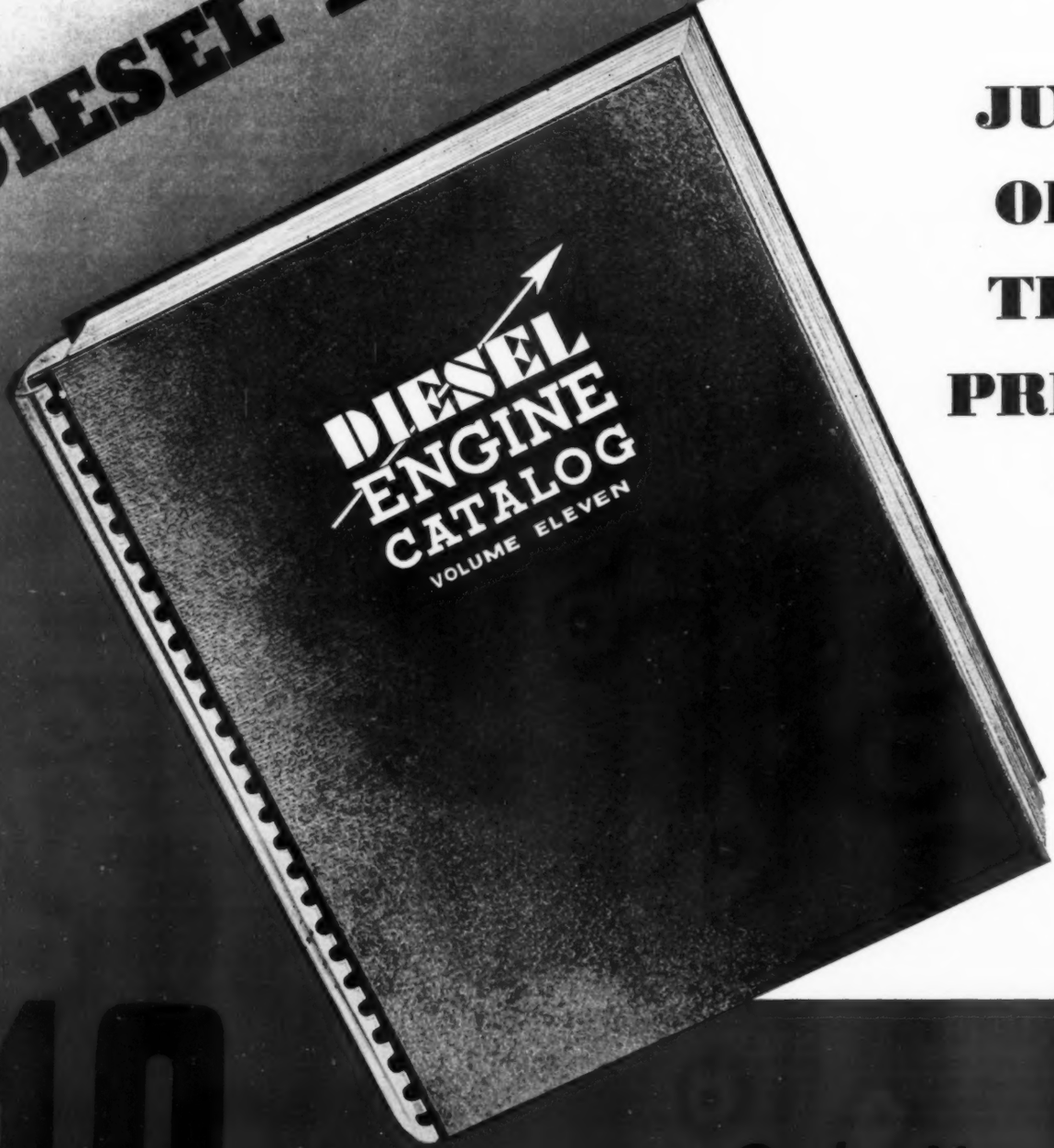
11th EDITION OF THE DIESEL ENGINE CATALOG



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Anderson Diesel Engine Company
Atlas Imperial Diesel Engine Company

Baldwin Locomotive Works
Buckeye Machine Company
The Buda Company
Busch-Sulzer Bros. Diesel Engine Company

Caterpillar Tractor Company
Chicago Pneumatic Tool Company
Chrysler Motor Company (Dodge Division)
Clark Brothers Company
Consolidated Diesel Electric Corporation
Climax Engineering Company
Continental Motors Corporation
Cooper-Bessemer Corporation
Cummins Engine Company

Enterprise Engine & Foundry Company

Fairbanks, Morse & Co.
Fulton Iron Works Company

General Machinery Corp. (Hooven, Owens, Rentschler Division)
General Motors Corporation
Cleveland Diesel Engine Division
Detroit Diesel Engine Division
Electro Motive Division
Gray Marine Motor Company

Hallett Manufacturing Company
Joshua Hendy Iron Works
Hercules Motor Corporation
Hill Diesel Engine Company (Division of Rogers Diesel & Aircraft Corp.)

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International Harvester Company

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Lister-Blackstone Inc.
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Mack Mfg. Corporation
Murphy Diesel Company

National Supply Company (Superior Engine Division)
Nordberg Manufacturing Company

Palmer Bros. Company

Rathbun-Jones Engineering Company
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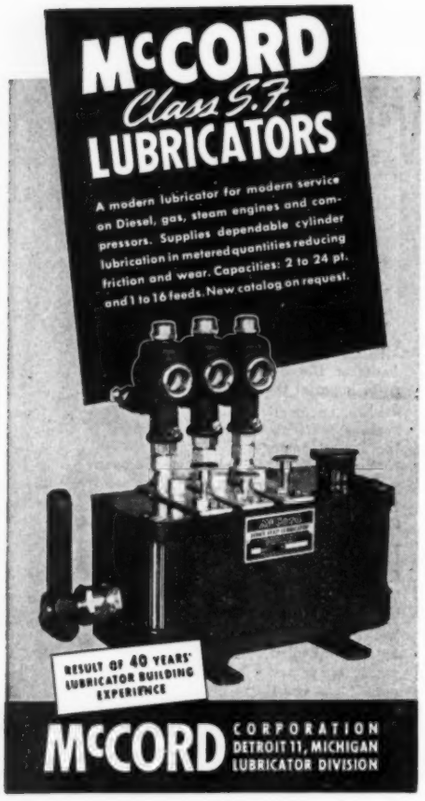
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Wood Named Head of SKF District

APPOINTMENT of Harrison Wood as New York district manager for SKF Industries, Inc., was announced recently by R. R. Zisette, general sales manager for the company. Wood, assistant district manager since 1941 and for many years a field engineer for the firm, succeeds John D. Williamson, who resigned because of ill health after serving as head of the district for 23 years. A native of Baltimore, Wood attended Cornell University and joined SKF in 1923 as sales engineer.

WEST COAST DIESEL NEWS

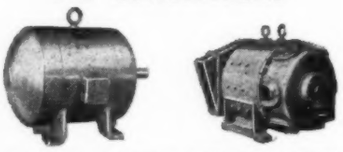
By FRED M. BURT

FORMER minesweeper *YMS-127,* now the *Vindicator,* owned by Capt. Wm. P. Lowman, Anacortes, Washington, is being converted into a tuna clipper at a cost of $40,000, and is now powered with two Superior Diesels of 200 hp. each.

POWERED with a Caterpillar Diesel, purchased from Thomas A. Short Co., San Francisco, Anderson & Cristofani, San Francisco, are constructing a 48 ft. x 13 ft. tug for Pacific Gas & Electric Co.

THE *Sport King,* a 65 ft., $55,000 cruiser, designed by Manuel S. Goularte, naval architect of Wilmington, Calif., for Darrell King and Norman Hagen, is powered by three 275 hp., 6 cyl. Cummins Diesels, turning up to 2100

BARDCO
MARINE MOTORS and GENERATORS



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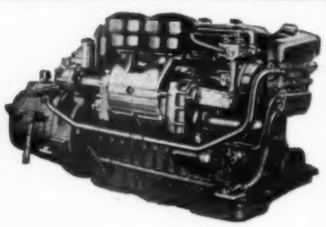

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1800 RPM • 4¼ x 5 Bore
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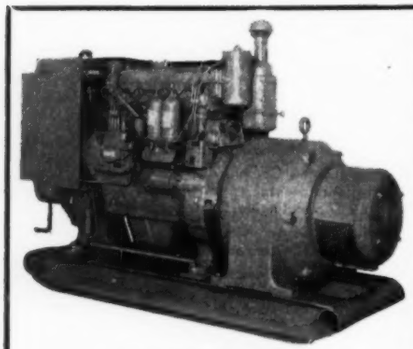

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Also A FEW REBUILT UNITS
10, 20, 25, 75 and 100 kw - AC and DC
QUICK DELIVERY
ALL UNITS GUARANTEED
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HYDRAULIC DIESEL INDICATOR

This NEW scientifically designed instrument will meet requirements for instantaneous reading of peak firing and compression pressure. It quickly indicates improper pressures due to defective injectors, faulty fuel pumps, leaky valves, or piston blow-by.
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rpm. Its three propellers will push it along at 20 mph. or better.

THE new welded-steel, 178 ft. 800 ton cargo capacity, freighter *F. E. Lovejoy*, constructed by Reliable Welding Works, Olympia, for Puget Sound Freight Lines, is driven by a 1200 hp. Fairbanks-Morse Diesel engine; on her trial trip maintaining an average speed of 11.4 knots.

TOWING three large oil barges each carrying another barge as deckload, tugboat *LT-215*, 126 ft. x 26 ft. has just completed a 7400 mile tow to China to deliver the barges. She is propelled by two 600 hp. direct-reversing, two-cycle, Fairbanks-Morse Diesel engines turning 71 in. x 34 in. Coolidge propellers.

THE new 65 ft. sloop-rigged *Spirit*, owned by Commodore Harold A. Jones of Royal Vancouver Yacht Club, has a 4 cylinder 110 hp. General Motors Diesel as a main engine, with a 5 hp., 4 cycle, Fairbanks-Morse Diesel as an auxiliary.

FOR all those interested in marine propulsion, a Diesel Engine Forum is scheduled to be held in San Francisco, November 7; presided over by Harvey T. Hill, executive director Diesel Engine Manufacturers Association.

M. C. NELSON, engineer in charge of experimental research specializing in hydraulic marine controls, has been promoted to be central works manager of Ellinwood Industires, Los Angeles. President Ray Ellinwood stated that he would have the job of speeding production on such controls and on electronics products.

THE new tuna clipper, *West Coast*, built by Lynch Shipbuilding Co., San Diego, for People's Fish Co., designed by Omar Schmidt, has a 400 hp. Enterprise Diesel; auxiliaries are a pair of 120 hp., 5 cyl. Lorimers direct-connected to 75 kw. Fairbanks-Morse generators.

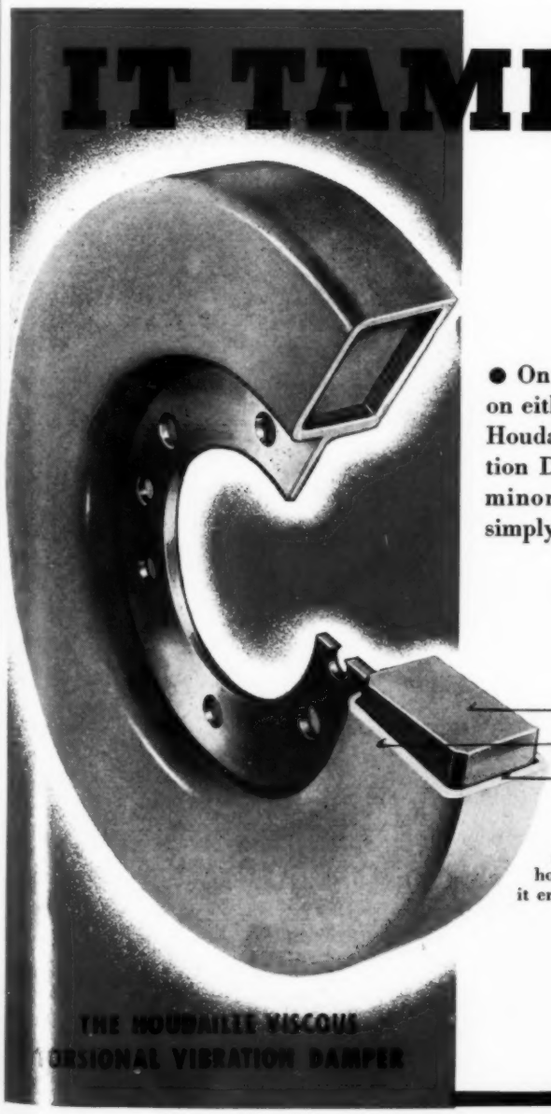
BACK after war service, tuna clipper *Conte Bianco* is being reconditioned in the Campbell Machine Co. yard. The original 410 hp. Union Diesel main engine is being retained, but a new 200 hp. Union auxiliary, direct connected to a 100 kw. General Electric generator, is being installed.

RECENTLY discharged as a Navy lieutenant-commander, Norman LaLanne has rejoined the Lorimer Diesel Engine Co., as northern

. . . . *And now please turn to page 110* . . . .

IT TAMES Vibration

. . . and RELATED TROUBLES



● On large engines or small . . . and on either gasoline or diesel . . . the Houdaille* Viscous Torsional Vibration Damper curbs both major and minor critical orders of vibration simply and efficiently. And by taming vibration, it solves related troubles as well. In cases where such problems have existed, it has proven highly effective in reducing engine noise and increasing the life of timing-gears.

Simple as A-B-C

(A) Inertia mass or fly-wheel
(B) Two-piece welded housing
(C) Synthetic fluid

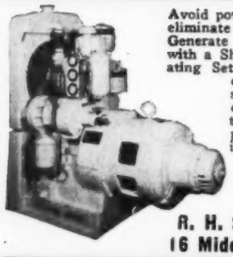
The Houdaille* Viscous Torsional Vibration Damper consists of only two essential parts . . . a two-piece welded housing and inertia mass or fly-wheel. Since it employs a synthetic fluid with relatively flat viscosity curve, its efficiency is not materially affected by variation in temperature. The Damper housing is hermetically sealed and there are no wearing parts . . . hence no service or replacement problem.

Houdaille engineers will be glad to discuss the application of the Viscous Torsional Vibration Damper to any internal combustion engine.*

HOUDE ENGINEERING DIVISION OF
HOUDAILLE-HERSHEY CORPORATION
MAKERS OF HYDRAULIC CONTROLS
BUFFALO 11, N.Y.

*Pronounced Hoo-dye

Sheppard Diesel
GENERATING SETS



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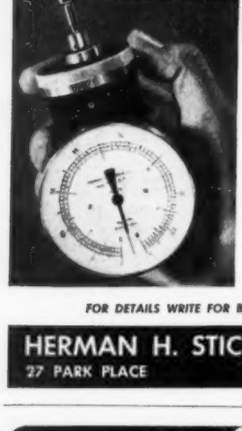

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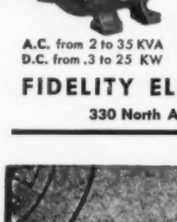

A.C. from 2 to 35 KVA
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FIDELITY A.C. and D.C. generators are built to exacting standards, covering a broad range of applications. Our thoroughly experienced engineers will be pleased to cooperate with you in designing to meet your particular requirements. Submit your specifications to us.

FIDELITY ELECTRIC CO., INC.
330 North Arch St., Lancaster, Pa.

California coast representative. Mr. LaLanne, among other duties, had charge of Diesel maintenance at Treasure Island during the war.

A 70 ft. x 19 ft. steel tug purchased from the WSA by the San Francisco Towing Co., is being remodeled and powered with a 450 hp. Enterprise Diesel engine.

MASTER Builders, Alameda, are constructing a new 98 ft. x 26 ft. purse seiner for Borti Petrich, San Pedro. It will be powered with a 560 hp. Union Diesel engine with two 60 kw. General Motors Diesel auxiliary generating sets.

BUILT for a syndicate of Southern Californians at Avondale Marine Ways, New Orleans, the 132 ft. all-steel tuna clipper *Paramount*, has completed its 5,000 mile delivery voyage through the Panama Canal, powered with a 1200 hp. supercharged Superior Diesel engine.

MONTEREY purse seiner *Frances Marie* has been reconverted from war time uses at Martinolich Shipbuilding Co. yard, San Francisco, and fitted with a new 400 hp. Enterprise Diesel engine.

THE *Kitty Hawk*, 131 ft. steel clipper, newest of the United Concrete Corp. fishing vessels, operating out of San Diego for San Diego Packing Co., is propelled by an 840 hp. Superior, supercharged Diesel, fresh-water-cooled. Auxiliaries are a pair of 200 hp. Superiors direct-connected to 125 kw. Westinghouse generators.

FISHING vessels returned from war service and being reconditioned for fishing by Western Boat Building Co., Tacoma—93 ft. *St. Francis*

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Satisfaction **VALVE SEATS**
Guaranteed **HARD SURFACED**

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Mechanics know that VELLUMOID gaskets are strong and compressible. Easily installed . . . no shellac needed . . . don't break when removed. In sheets or ready cut gaskets for all motors. *Sold Through Jobbers*

THE VELLUMOID CO., WORCESTER, Mass. & DETROIT, Mich.

with a 400 hp. Enterprise main engine; auxiliaries, General Motors and Buda Diesels. *Phoebe* with a 400 hp. Atlas and Buda and General Motors auxiliaries. *Western Fisher*, 96 ft. seiner, with a 400 hp. Atlas.

THE 102 ft. clipper *Sea Wolf*, just regained from the Navy by its San Diego owners, has had a major conversion job in Martinolich's San Diego yard. The main power is a 400 hp. Superior Diesel; two 150 hp. Superior Diesel auxiliaries driving 90 kva. generators, Fairbanks-Morse as are the two 10 in. bait pumps driven by 15 hp. FM motors.

TWO new 120 hp. Cummins auxiliary Diesels have been installed in tuna clipper *Galapagos*, San Diego, driving 60 kw. General Electric generators, as part of its reconversion after several years naval service.

THE 65 ft. tuna clipper *Oceana*, owner Tom Bagalini, has been repowered with a 175 hp. Union Diesel to replace a 90 hp. Union; installation made by Campbell Machine Co., San Diego, who originally built the vessel.

AT the Mormon Island Boat Works, Wilmington, Calif., A. J. Hall's 55 ft. baby tuna clipper has just been repowered with a new 150 hp. Lorimer Diesel—the auxiliaries are Sheppard Diesels and the vessel has Baker refrigeration.

THE *Chicken of the Sea*, one of the largest, most modern tuna clippers afloat, has just been equipped with a specially designed carbon dioxide fire extinguishing system, installed by Walter Kidde & Co. of Belleville, N. J. Her 1500 hp. main engine and two 265 hp. main auxiliaries are all Enterprise Diesels and a smaller standby unit is a Caterpillar Diesel.

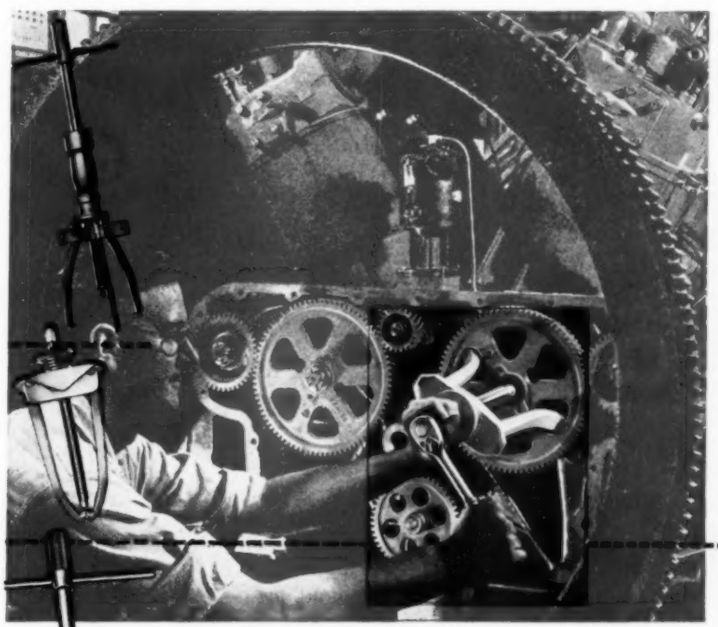
THE big purse seiner *St. Christopher*, built by Puget Sound Boat Bldg. Co., has just been delivered to its Monterey owners, powered with a 400 hp. Enterprise Diesel for a 10 knot cruising speed; the auxiliary is a 65 hp. Caterpillar Diesel.

THEODORE CANEPA, Dominic Favalero, and Jack Malloy, all Monterey fishermen, have purchased 20 hp. Lorimer Diesel engines. Cecil A. Baldwin, Hayward, Calif., fisherman, has purchased a Caterpillar marine Diesel from Thomas A. Short Co., San Francisco.

W. C. GOULD, marine sales manager for the Detroit Diesel Engine Division of General Motors has announced the appointment of Muirson C. Wright as marine installation engineer for the West Coast. A graduate of Stanford, Mr. Wright has had 15 years experience in the sale and installation of various marine engines.

FOLLOWING are the names and Diesel engine equipment of the 14 Pacific Coast purse seiners and draggers enroute to China under the UNRRA program—

	Main Engine—Diesel
Pacific Star	250 hp. Enterprise
St. Anthony	175 hp. Fairbanks-Morse
Joseph Balestrieri	250 hp. Enterprise
El Rey	220 hp. Atlas
Jackie Boy	220 hp. Atlas
Rosanne	200 hp. Atlas
Flying Fortress	250 hp. Enterprise
California Star	200 hp. Enterprise
Fisher Lassie	400 hp. Enterprise
A. C. Martinolich	250 hp. Enterprise
New Madrid	160 hp. Atlas
Oceana	200 hp. Washington
Pride of America	250 hp. Atlas
North Star	135 hp. Atlas



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give you safe, uniform power over entire range

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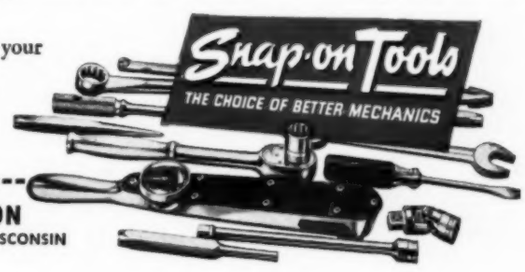

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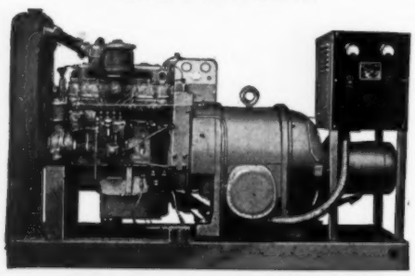

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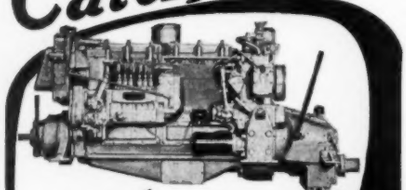

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